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EDITORIAL NOTES.

To Settle the Calorific Value Standard.

AT length the Gas Light and Coke Company's Bill has been embraced in a group of gas measures (in which is that of the Liverpool Gas Company) referred to a Committee of the House of Lords, who will commence their sittings on April 28. The Gas Light Company's Bill, as readers are aware who have followed the Committee proceedings of the session up to the present stage, is the one which the Parliamentary Authorities are hoping will finally cast the terms of calorific value clauses, though really we cannot see what can better, in nomenclature and form, the South Suburban clauses agreed to in the session of 1912, and which the Gas Light Company's clauses follow in all respects save that they specify that the gas shall be so tested that credit shall be given for its total heat value. Nearly all the Bills of the session in which a calorific value test is sought in place of the illuminating power one are in this one particular being held in abeyance for the Committee's decision on the Gas Light Company's Bill. For those promoting concerns the decision will therefore be of considerable importance; but for the gas industry generally the result, whatever it is, will be of immense moment in respect of its future operations. Of this we may be sure, that the Governor of the Gas Light Company (Sir Corbet Woodall) and his colleagues will not accept anything that will be detrimental to the interests of either the great London concern the fortunes of which they direct, or of the gas industry at large.

As we have said before, we cannot see why the clauses of the Gas Light Bill should have raised any opposition, or why the terms—except in respect of the numerical conditions where circumstances are not favourable—should not be applied generally. Everybody who knows anything of the subject admits that the heating value of the gas is the superior quality to-day; and he knows that very little gas is used *per se* for its luminous property, and part of that which is so used is by people indifferent to the realization of far better results, and at lower cost, by incandescent burners. If the opposition is going to take the line that something ought to be done to secure that the gas should have upon it two standards of quality, with two penal tests, then the gas industry will strenuously and persistently resist such an unjust imposition; and gas undertakings will certainly refuse to apply to Parliament for a calorific value standard until the righteousness of the single standard is established, and calorific value is recognized as the dominant one. Better is it for the quality that is the requisite for some 90 per cent. of the gas of the country to be defended by the statutory standard and test, than for the statutory standard and test to be based upon the quality required for (say) one-tenth part of the supply, and that one-tenth part largely the need of people who are heedless about using the gas in the most economical manner. The London County Council agreed (after long experience of calorific value testing in London) to the calorific value clauses in the case of two large gas concerns with parts of their areas in London—the South Suburban and the Wandsworth, Wimbledon, and Epsom Companies; and they also, under the advice of their experts, concurred in the terms of these clauses. There can be no valid objection to the expressions in the South Suburban clauses, as a large amount of expert evidence can be brought to bear to show that they are best applicable to the circumstances. We see that, in the case of the Middlesbrough Corporation Bill, a Committee last week passed the calorific value clauses with the standard expressed in "calories" and "net;" the Corporation pressing for the passing of the clauses just as they stood. Why the terms, for the sake of uniformity, could not have been expressed in "B.Th.U." and "gross," we cannot understand; and even now, presuming that the Gas Light Company's clauses are passed, the terms might, for the sake of uniformity, be converted. The Corporation would not lose anything.

However, with regard to the decisive contest over the Gas Light Bill, there will be some little curiosity to see what lines the opposition will take. There will be a fair discussion over the matter. The constitution of the Committee gives the fullest assurance in saying so. Lord Clinton is to be the Chairman; and the other members of the Committee are Lord Lonsdale, Lord Erskine, Lord Monkswell, and Lord Gorell. What the gas industry asks the Committee to consider is the largest present, and the still greater prospective, service of gas supply. If the Committee view the matter from this standpoint, there will be no halting on their part as to the decision that should be given.

The Dublin Blunder.

THE shareholders of the Alliance and Dublin Consumers' Gas Company have blundered—not consciously, but through incomplete information, owing to the withholding from them of the report of the two experts (Mr. William Newbigging and Mr. W. R. Herring) who have been investigating the affairs of the Company. The opportunity has been lost of putting on the Board a strong Director, technically and commercially qualified in gas manufacture and supply. On the Board to-day there is no one who is qualified to show what is best to be done, and how and when it should be done, to secure the utmost possible out of the concern, and to save the substantial sum of money that we believe it is possible to save, in connection with it. It is abundantly clear from the report of the proceedings at the meeting that the "brute force of numbers" has established a position which, we are confident, is not the best that could be established; and this position has been brought about, firstly, by the Directors keeping the shareholders in the dark as to the contents of the experts' report; and, secondly, by the friendly disposition of the majority of those present at the meeting, and by the reserve force of proxies held by the Lancashire Committee and the Directors. It was no use trying at the meeting to break through such barriers. The work of the meeting had, in effect, been done before it was held. The attempt made by Mr. R. W. Edwards to get the meeting adjourned, in order that a Committee of Shareholders might investigate the experts' report and make recommendations, was futile; the endeavour made to get an expert in gas engineering, in gas trading, and in gas management generally—Mr. W. R. Herring or Mr. R. B. Anderson—on the Board was in vain. The Lancashire Committee and the Board between them, with the shareholders totally oblivious as to the nature of the contents of the report, were absolute.

What was there in the report that the Directors did not wish divulged to the shareholders? It is perfectly clear the report, reviewing the financial position of the Company and its working generally, could not have been a certificate as to a superlative conduct in all respects of the Company's operations; and the shareholders had a right to know the contents of the report, before they were called upon to elect new Directors—one to a vacancy, the other two to make up the number to eight. It is true the shareholders had (we overlooked the point in previous comments) the right to have the report circulated by passing a resolution at the meeting; but who had they to lead them sufficiently early in this regard? No one knew the report had been presented except a chosen few; and this few appear to have been carefully bound over to secrecy as to its contents. The Directors—very naturally—told the shareholders the report should have serious consideration; the Lancashire Committee, through Mr. F. J. Dickens, informed the shareholders that, in the interests of the Company, it was not advisable that the report should be published. It was not the experts' investigation that brought the concern to its parlous state, but something antecedent. What was that "some-"thing antecedent?" The report alone can fully disclose. Its publication could not possibly have made things worse

than they are; and it would certainly have served as a guide to the shareholders.

Then, when the meeting of shareholders came, the Lancashire Committee were, in consequence of what had happened, so well fortified that it was waste of time attempting to do anything to alter the project which prevented, on the one hand, the publication of the report of the two experts (which met the views of the Board), and, on the other, an expert being placed on the directorate. The Board and the Committee appear to have been working most amicably together; and the bond of sympathy between them is of a striking character. Mr. Dickens—the prime mover from the Lancashire district, and one of the new Directors—told the shareholders that his circular-letter in the middle of March was kept back, as he thought it advisable it should reach the shareholders by the same post as that by which they received the Directors' report. Mr. Dickens, in this respect, was well primed in the movements of the Board. Then at the meeting, another of the new Lancashire Directors—Mr. W. H. Davies—referred to the trying times that the Directors had had during the past six months; and his sympathy with them was profound and sincere. It was a charming picture—the representatives from Lancashire defending the withholding of the report from the light of day, and condoling with the Directors upon the past six months' difficulties, and the old Directors (while leaving the shareholders altogether in the dark as to the nature of the experts' report) seemingly welcoming Mr. Dickens and his two Lancashire associates—Mr. Davies and Mr. Augustus Bond—with open arms.

However, Mr. Davies, in his sympathetic references, obviously overlooked the fact that it has taken more than six months for the concern to drift into its present state. The constitution of the Board, however, remains in major part as it was, *minus* Mr. Lawler. That is to say, there are now five of the former Directors in office, and the three newly appointed ones from Lancashire. We have nothing to say against these three gentlemen from Lancashire as men of business and men of common sense; but we do still hold that it would have been wise had one of the new members been an expert in gas affairs—technical and commercial. Mr. Dickens's attitude on the question is interesting. He would, we take it, have us believe that, in the matter of the conduct of a cotton-spinning mill, a business board of men well versed in gas finance and gas commerce would be far superior to a Board with a cotton spinner—technically and commercially trained and competent—upon it. With all respect, we decline to believe him. He did not in words, but only in effect, say what we have just represented. What he did say was that he was strongly opposed to a gas expert on the Board of the Alliance and Dublin Consumers' Gas Company. What would happen, he asked, if an expert were elected to the Board? "If," he himself replied, "the "expert was a strong man, he would dominate the whole "Board, and the policy of the directorate would, in time, "become a one-man policy." What matters, if the "strong "man" is competent to serve both consumers and shareholders? But we cannot imagine Mr. Dickens deliberately confessing (whatever he does for the sake of argument) that he, Mr. Davies, and Mr. Augustus Bond are three such weaklings, and that the older members of the Board are likewise, that they—numbering seven in all—would be overruled by one man, if their own commonsense did not tell them that that man was right in the recommendations he made.

Mr. Dickens may speak from his own experience in another line of business; in the gas line, we cannot yield place to him in the matter of knowledge. We know that the presence of an expert on the Board has been the making of a strong position for many a gas concern. It may be true that the examination of some gas accounts does show that the capital per 1000 cubic feet has increased since an expert has been on the Board. The money, however, may have been a very wise and profitable expenditure, in view of the condition of the concern before the advent of the expert. The Gas Light and Coke Company a time ago had seriously drifted; Sir Corbet Woodall was elected to the Board, and then to the Governorship. This election was the salvation of the Company. The South Metropolitan Gas Company has Mr. Charles Carpenter—also an expert—for its Chairman; on the Board of the Commercial Gas Company there is an expert, Mr. Henry E. Jones. The Wandsworth Company, of which the last-named gentleman is Chairman, sells gas at about half the price charged by the Dublin Company. The Tottenham, South Suburban, and Croydon Companies, and numerous others, have experts on their Boards. Is Dublin selling gas at as cheap a rate as any of the Companies specifically named; is the Dublin capital per million feet as low as theirs; and is the Dublin dividend as good? "What we want are dividend-earners, not money-spenders," said one of Mr. Dickens's correspondents; and this gentleman, with great elation, quoted the words. There was applause from some of those present who are receiving a a dividend at the rate of 2½ per cent. from a Board without a modern qualified expert upon it. Altogether a nice mess has been created in Dublin gas affairs, and under an administration not one of the members of which claims to be a modern gas expert. There is still no expert on the Board, although Mr. Dickens, Mr. Davies, and Mr. Augustus Bond have been elected to seats. In short, Mr. Dickens was most unfortunate in both time and place, with the melancholy example of the Dublin Company's condition before him, in his arguments on the subject of an expert Director.

However, the Board is cast. What is to be their policy? They have the report of the two experts before them; and Mr. Dickens indicates one line of policy. "A good resident "engineer, and an expert as consultant to be called in as "and when one is required." We intimated in our previous article what, in our opinion, from a large experience in the gas industry, is required at the present juncture in the affairs of the Dublin Company. In the absence, however, of an expert Managing Director, something more than an occasional reference to a consultant is necessary. The consultant should spend a considerable time in Dublin, and keep in close touch with all the Company's affairs till reformation is complete, and the Company is thoroughly established technically and commercially, and has regained the confidence of investors, while serving the citizens of Dublin well, and at a reasonable price.

Thoughts from the Informal Meeting.

FULL of thought and practical advice is the address with which Mr. William Wilson opened the discussion at the Informal Meeting of Scottish Gas Managers last week. The position of affairs in the industrial world, and the situation of the affairs of the gas industry last year through the conditions of the markets for raw and secondary materials, afford between them plenty of scope for very serious reflection. The expenses per ton of coal carbonized have been going up; the revenue per ton of coal from bye-products has been on the decline. Between these two adverse conditions has come a higher revenue from gas by increased makes per ton of coal to help to relieve the situation, but not completely. Mr. Wilson, like other modern occupants of presidential chairs, looks to improvements being effected in the yields and qualities of the secondary products to mitigate the irony of the trading circumstances of the day. The unsettled conditions in the industrial world are (we are all only too well aware) a constant source of worry—especially the periodical uncertain eruptions in the coal-fields. Mr. Wilson would like to see the Government take this matter seriously in hand—as seriously (let us say) as the Home Rule Question, to ascertain whether they could not evolve something that would yield to the industries and people of the country a continuous supply of coal, at an approximately level price. It is suggested in the address that this might be accomplished by the nationalization of the mines or by some other method. Nationalization of the mines is not a very taking proposition; and we do not appreciate the idea of seeing the Government of this country engaging in any form of trading. There are many objections to such a scheme; and many pitfalls for the Government that attempted anything of the kind. As to the "other methods," Mr. Wilson does not enlighten us as to what in his opinion is possible. But certainly there ought to be a way of regulating matters in the coal industry, in view of the supply of raw fuel at a reasonable price being of such vital importance to the prosperity of the whole nation. But the Legislature appears far too occupied with matters of partial national importance to devote attention to a question of moment to Great Britain and Ireland. We must therefore jog along the best we can until the Legislature is awakened to the fact that coal is one of the things that stand predominant among the interests of the country.

The subject of the disposal of coke comes up again; and Scotland claims in this regard to be in a somewhat different position from the rest of the country. There seem to be

two reasons for the difference: The one is that the percentage of ash in the coals available in Scotland is higher than is usual in coals farther south; and this high percentage of ash is a deterrent to the development of household consumption of coke. The other reason is industrial demands vary so considerably that, when they are good, household demand is neglected, as large industrial business is far more suited to a gas-works than the retailing of coke in small quantities. The result of this is that there is no continuity in the business relations in coke with the householder. The reasons are insufficient for the neglect of the household business. The encouragement of the domestic trade should provide a steadier market for coke in the winter (when production is greatest) than the vacillating demands of industry; and thus, when industrial demand is good, and it happens that the local works cannot, while meeting that demand, keep level with household requirement as well, there ought to be ready means, through the intercommunication provided by the commercial sections, of providing all the dry coke necessary for household use. We are not prepared to subscribe to any excuses for neglecting the household customer. And as for the ash (a high percentage of which is as great a drawback to many industrial purposes as to domestic use), Mr. Wilson does not bring this into the calculation when he considers the question of whether gas-works could meet the demand for domestic coke if legislation came along compulsorily requiring the cessation of the discharge of smoke from chimneys. He believes the necessary quality of coke could be obtained for the purpose by altering the method of heating retorts to that obtaining with coke-ovens—utilizing for retort-heating (say) 50 per cent. of the gas produced, and selling the other half. There is ambiguity about this; and we find it difficult to understand why half the gas should be utilized in retort heating, unless the idea of benzol recovery is in Mr. Wilson's mind. With its 14-candle standard, we do not think that Falkirk would find it a financial benefit to conduct its gas-making as suggested; but an expansion by Mr. Wilson of his views on the point might be of advantage. It is of the cardinal principles of the industry that we cannot in these days subordinate our gas-making capabilities to a speculative demand for coke.

Even after this we get the President advancing another reason against the development by a municipal gas undertaking of the household use of coke, and that is competition with the ratepaying retail vendors of coal. This was a point we dealt with in commenting on Mr. Robert Watson's paper at the Bradford Conference of the local section of the British Commercial Gas Association. When a gas supply business cannot under municipal direction be carried on so as to make the best possible of it (subject to there being no hazard in the methods adopted), then there is exposed a weakness in the undertaking of such commercial enterprise by a local authority. The statutory general purposes clauses of gas concerns give power to produce, sell, and deal in the residuals of gas manufacture; and there is no proviso to the effect that the trading is to be hampered and detrimentally affected because the local coal merchants prefer to develop their coal business, and not that of the locally produced coke. However, Mr. Wilson discloses his carbonizing objective, if the opportunity comes to him, when he says that it may be more profitable to adopt chamber-ovens, as some 25,000 tons or so of metallurgical coke are used in the borough annually, and the average price paid for it is never less than 100 per cent. more than is obtained for the ordinary coke. There, again, metallurgical coke is not suited for all purposes; and earlier in the address there is reference to the vicissitudes of industrial fortune owing to many and various causes, which result in an oscillation in the industrial demand for coke. If ovens were adopted, they would have to be of an order in which coke of varying description could be produced according to the demand and the purpose.

The President also treated of the question of recovering the maximum possible quantity of ammonia, and what he has to say forms the basis of the article succeeding the present one. There are, however, one or two other topics in the address which arrest attention. Not for the first time, Mr. Wilson publicly refers to the adoption at Falkirk of horizontal atmospheric condensers in place of water-cooled ones. On the last occasion he did so, he attributed the then cessation of naphthalene troubles to the change effected in the condensation plant; but it is probable that another factor was a superior cause in the naphthalene experience, which subsequently had a rude shock, and diverted to a different channel some of the credit from the atmospheric condensers. Another change had been made about that time, and that was the covering of the gasholder and station meter water with a thin film of shale naphtha. The idea was borrowed from America; the claim being that the thin film of naphtha prevents additional moisture being absorbed by the gas, and, so long as the gas is kept approximately dry, there is less trouble with naphthalene. Subsequent investigation disclosed that the more likely thing that had happened was that the naphtha was taken up by the gas, and that this acted as a vehicle for carrying the naphthalene. When the film of naphtha had been absorbed, then there was a recurrence of the trouble. When a film of naphtha was replaced on the holder water, the naphthalene difficulty was again suspended. Now Mr. Wilson is exercised as to whether, to deal with the naphthalene trouble, the automatic carburetting of the gas in this way is more advantageous and economical than is the regulated mode of a carburettor used according to needs. While the process of filming the gasholder water appears to be efficacious for the purpose, it is, to say the least, a crude method; and our own leaning would be towards some process of systematic and regulated procedure. The new atmospheric condensers have thus been deprived of at any rate part of the credit for the relief from the annoying naphthalene troubles; but they have now had placed to their account a noticeable greater regularity and constancy in the candle power of the gas. Any improvement in this regard attributable to the change to atmospheric condensers is no doubt due to the reduced removal of the lighter hydrocarbons by the deposition of the tarry vapours; the more rapidly the condensation is effected, the greater the removal of the lighter hydrocarbons in that way. There are several other interesting points in the address; but having yet one more to notice, the others must be left without comment.

Ammonia Gains from Avoidable Losses.

GREAT minds are said to frequently jump together. There must be quite a considerable number of such minds in the gas profession, seeing the amount of concurrent consideration that is being given to the question of the recovery of larger quantities of ammonia from the coal carbonized for gas making than has hitherto been realized; and the measure of the improvement made is the measure of the waste that has been taking place. It is not a discreditable thing to recognize that the best has not been done in the past; but there is something very creditable in effecting and maintaining an improvement. We have of late had various Presidents calling attention in their addresses to this subject; and they have confessed to having caused improvements to be made in their own working which have resulted in a larger production of sulphate of ammonia. Mr. Wilson has been investigating the question, and has shown that, on taking charge at Falkirk, results, in the matter of tar and liquor, were not being obtained that were realized at his previous works; and when he subsequently started an ammonia plant, he failed to get the results anticipated—only 23 lbs. of sulphate of ammonia being produced per ton of coal. This he has since been able to increase to 26 lbs. In these days of lower sulphate prices, an additional quantity for sale per ton of coal is a contribution of material importance to revenue, whatever be the market value of the sulphate per ton. Of course, comparisons as to sulphate make between works may be fallacious on account both of variations in the coals used in regard to nitrogen content and of differences in the temperature of carbonization; but frequently the differences in make found in the same locality are due to want of care in connection with working and storage, and so they are distinctly chargeable to avoidable waste.

From seal-pots and storage-tanks a large amount of waste by evaporation can be found in many works. There has been no difficulty in detecting this by the nose in not a few works, as well as by indications of injury to wrought-iron elements of plant in the neighbourhood of the escape. Mr. Wilson first sought to save ammonia by putting a film of ordinary paraffin oil on the surface of the liquor in the storage tank; and he worked his sulphate plant day by day. The make mounted up to the 26 lbs. previously referred to; and Mr. Wilson is not satisfied to rest at this point. But about the film of paraffin on the surface of the liquor to prevent evaporation. Is the film something of a lasting character? With the discharge of fresh warm liquor into the tank, it

must be affected by both agitation and temperature. Later on, it is noticed that Mr. Wilson is proposing to carry all his liquor-pipes to the bottom of the tar-well, so as to prevent the agitation of the liquor in stock by the fresh liquor falling on to it. This appeals to us as an excellent arrangement in the quest for means of conserving ammonia by preventing its evaporation. The President says he knows of a works in London where, by this one expedient, the yield of sulphate of ammonia was increased from 24 to 28 lbs. The seal pots are to receive treatment next by altering the liquor overflows from the scrubbers; the President being satisfied that the pots are the seat of a considerable loss of ammonia annually. His conviction in this respect has been a long acknowledged fact in many gas-works; nevertheless there is abundant evidence of neglect in endeavouring to overcome the waste. The address contains a description of how it is proposed at Falkirk to effectually obviate loss at this point. Continuous working of a sulphate plant day by day is also an important factor in a good make of sulphate per ton; for ammoniacal liquor does not improve by keeping in store. But a difficulty is that all works are not in the position to keep a sulphate plant going continuously; and this supplies good ground for argument for the co-operation of large with small neighbouring works. But they are very small works which cannot adopt a direct-recovery system—the same as certain of the works down South.

While speaking of direct-recovery systems, reference may be made to a contributed article in this week's issue by Mr. G. Stanley Cooper on the direct-recovery ammonia system as devised by Koppers. The article is in response to a suggestion of ours a short time since that there would be pleasure in publishing some "definite particulars from actual working." Mr. Cooper does not comply with this suggestion. The results are hypothetical, though doubtless possessing a defensible foundation so far as they go. The yield of ammonia obtained by the employment of the process, the author says, is "*probably*" larger than that secured by scrubbing, as there are few channels of loss. A little lower down we have him saying "*assuming* a yield of 1·4 per cent. of sulphate of "ammonia." Probability and assumption are not what we asked for. However the 1·4 per cent. would be equivalent to about 31 lbs. of sulphate per ton of coal carbonized. Mr. Wilson in his address refers to a works in the neighbourhood of Glasgow which is making 32 lbs. of sulphate per ton; and the tendency is now, by attention to ammonia losses, to get farther away from 20 lbs., and to approach the 30 lbs. even with scrubbing work. This is where gas men want to ascertain, by actual working figures under defined conditions, from the *alpha* to the *omega* of the data—from the nitrogen content of the coal onwards—what are the comparative working details by the best that can be done under the old washing and scrubbing system and under the direct system. There ought to be little difficulty in supplying this information, seeing that Mr. Cooper writes: "In every case "where the direct process has been substituted for the old "system, an increased yield of ammonia has been obtained." We desire to know more about this increase—more about whether it is shown by bad working and avoidable losses in pre-direct working days, or by positive advantages inherent and special to the direct system. We believe there is much in the direct system of working, and that there is to be a large future for it in the gas industry when illuminating power recedes from view as a surviving fetish of the days when the best method of obtaining artificial illumination was by the luminous flames of gas. There are, however, other interesting matters in the article—a description of the Koppers direct process, and references to the removal of tar, and to the means taken to prevent dilution of the acid by moisture condensed from the gas. The typical analysis of sulphate given by Mr. Cooper describes what we should call excellent quality—25·3 per cent. of ammonia is good; a moisture content of 0·3 per cent. is low (up to 2½ per cent. is not considered a detrimental percentage); and free acid amounting to not more than 0·3 per cent. merits no complaint. We are glad to see that so much attention is being bestowed on this question of ammonia recovery. It is a matter that deserves what it is now receiving.

Average Make per Ton—11,733 Cubic Feet.

PLEASED indeed are we that it is a very rare occurrence that attention has to be drawn to a miscalculation of figures in the "JOURNAL" columns. But we have to plead guilty to an error in a figure that appeared in the editorial comments, a fortnight since, on the recently issued Board of Trade returns relating to gas undertakings. Unfortunately, it was the figure that was most vital of all to the part of the comment treating of the working of the year. We are glad, however, that the mistake was detected; and we here acknowledge our indebtedness to Mr. J. H. Brearley for calling attention to it, so that early rectification can be made. The figure in question is the one referring to the make of gas per ton of coal carbonized; and all parts of our previous comment upon this particular subject are withdrawn, and the present figures substituted. The error arose in subtraction; and a difference of "1" at the millions end of a line of figures was the cause of representing the average make as only 11,110 cubic feet, which figure showed a decline in the average production per ton, compared with immediate past years. It is gratifying to find that the erroneous figure was an unintentional slander on the year's working, and that the year actually progressed in its result per ton of coal carbonized—the average make per ton of coal having been 11,733 cubic feet, or 161 cubic feet more than the year before. Therefore what we had anticipated actually came to pass; and all we had to say in extenuation of a lower level of production during the coal strike year has, in the circumstances, no application, as the year stands out in this respect of make per ton beyond all other years.

Coal Contracts and Labour Disputes.

The information published in last week's issue regarding the Durham coal contracts for the London gas companies was confirmed by the information published simultaneously in other quarters. The prices upon which contracts have been settled range from 10s. 7½d. to 12s. per ton f.o.b. Tyne or Wear. The information is given that "the reduction has not been secured without hard bargaining; for the North Country coalowners are in a fairly strong position, and some of them have conceded the substantial reduction with great reluctance." This we can well believe. The doubt existing as to the purchase of German coal by one of the London companies has been, up to a point, set at rest by an official, but very guarded, statement in the House of Commons [see "Parliamentary Intelligence" to-day] to the effect that the information is true, but how true, and which Company, are not divulged. In regard to the quantity purchased, the daily newspapers have now come down from the estimate of a million or a million-and-a-half tons, as we felt sure they would have to do, to something much lower—250,000 tons being the quantity now mentioned. Perhaps there will be occasion for them to make a further considerable recession. An uncomfortable position has been created by the strike of miners in the Yorkshire coalfield; but it is not expected that it will be of long duration. Everything is against this—funds, and the hopeful negotiations for a settlement of the points in dispute. The men themselves are responsible for precipitating matters; their leaders being in more peaceful mood The general view is that there is no occasion to pay fancy prices owing to the strike; and there is no occasion to make next contracts with this strike as a factor in the situation. The only uncomfortable thing about the strike is that gas-works that draw their supplies from Yorkshire, and have not good stocks in hand, may have to buy at fairly high prices on the open market. This may apply more to the works that are neighbours to the pits than to those at a distance, who have to provide against greater contingencies in respect of the interruption of supply. Generally, the unrest in the labour world continues to force itself upon notice in a most unpleasant way. There is the London building strike still in full swing after many weeks' run; and the London electrical workers have now in part "come out." Negotiations have been opened between the railway companies and their men for a settlement—through a Committee of the Companies and a Committee of the Executive of the National Union of Railwaymen—of general grievances. The men (Mr. J. H. Thomas, M.P., says) are determined that no settlement shall be arrived at that does not include complete recognition to their unions.

Quenching Coke with a Minimum of Water.

This is a subject that has received considerable attention in connection with the attempts to improve the quality of coke, and to give users a higher calorific value for their money. Mr. Joseph M'Nicholl, of Warrington, has been making a study of the matter,

and has incorporated the results in the highly practical Presidential Address that he delivered last Saturday to the Manchester and District Junior Gas Association. The point as to quenching coke so as to have the fuel ready for consumers in a practically dry state is one of the greatest difficulties under the present crude systems of carrying out this operation. The only thing to be done, until some genius evolves an improved method, is to make the best of the systems in vogue. This is what Mr. M'Nicholl (with his chief, Mr. W. S. Haddock) has been doing. The system that, under present circumstances, is by far the superior one is to run the coke-bogies under sprinklers, treat the coke by their aid, tip in shallow layers in the yard, and then load into carts by hand. It is found that coke dealt with in this manner is practically moisture free, owing to the sprinkling causing only superficial quenching, while the interior of the coke remains sufficiently hot to drive off almost the last trace of moisture present. With hose-pipe quenching, and its transference direct to the hoppers, stock, or waggons, the coke is found to contain 3 to 15 per cent. of moisture. Washed coke contains as a rule 20 to 23 per cent. of water on leaving the washing-tank. The depreciation of the calorific value of the coke by these high percentages of moisture is not a commendation for either domestic or industrial purposes, seeing that 9 per cent. of moisture reduces the calorific value of the material by about 10 per cent. At Warrington they are now considering a method of coke-quenching to work in conjunction with a telpher plant, by which the coke will be hose-quenched on an elevated platform, instead of following the system somewhat common with telpherage, of dipping the coke into a tank of water, and which process has never appealed to us. If the system is developed, we hope Mr. Haddock or Mr. M'Nicholl will let us hear more about it, and their experiences.

Manchester University Lectures.

We shall be very sorry if the lack of enthusiasm, and consequently of attendance, at the Manchester University Saturday afternoon lectures result in their discontinuance. Our Manchester district friends, before the lectures were inaugurated, made much of the fact that the professional gas aspirants in the Leeds area had at one time greater privileges than they had, although having a University in their midst at which science and industry are brought into close communication. Through Professor Harold B. Dixon, they have had privileges and opportunities extended to them; and there has been some excellent technical literature resulting from the lectures at the University. But now we have Mr. M'Nicholl, in his presidential address to the Manchester Juniors last Saturday, referring to the subject in these terms: "The number who attend the Saturday afternoon lectures is very disappointing, and not calculated to encourage your Council to further develop this most important means of higher education."

Undue Preference.

The case in which the Long Eaton Gas Company are seeking a declaration of the High Court that certain differential charges made for electricity by the District Council are outside their statutory rights, and are an undue preference, came last Friday afternoon before Mr. Justice Sargant. There is no allegation that the Council are not entitled to make differential charges for different purposes—that is to say, one charge for lighting, and a lower charge for power; but what is objected to, and what is asserted to constitute an undue preference, is when the Council, apparently in order to take lighting custom from the Gas Company, offer a factory owner electricity at a cheaper rate for power if he also uses the current for lighting. The effect of this is that a factory owner who requires "a corresponding supply" for power, and uses gas for lighting, has to pay more for his power service than the other owner—simply and solely because he prefers gas for lighting. The result of the undue preference or favour is, it is submitted, to deprive the Gas Company of custom. There are numerous cases where electricity suppliers show an undue preference to people who light the whole of their private houses with electricity, and promise to abstain from the use of other illuminants. The effect of this is that the tenant of a large house using both illuminants may have to pay more per unit than the tenant of a much smaller house, with a lower consumption, who only uses electricity. His Lordship is invited to say that this sort of thing is not right, and is beyond the powers of differentiation as conferred by the Legislature.

Minimum Conditions.

A further effort at State regulation of adult labour is represented by the Labour (Minimum Conditions) Bill, which was presented to Parliament by Mr. Barnes some days ago. It is a measure which has for its object to provide for minimum rates of wages and maximum hours of labour, and to otherwise regulate working conditions in certain circumstances. In the first place, it is sought to establish Trade Boards in connection with occupations in which the rate of wages usually paid to an adult worker of either sex does not exceed 25s. per week, or where application is made by a trade union, and in the opinion of the Board of Trade the establishment of such a Board is desired by the majority of persons engaged in the industry, whether as employers or employed. When once established, the duty of the Trade Board would be—subject to consideration of any special circumstances of the industry, the locality, or the workers concerned—to endeavour to establish in every occupation a standard rate allowing adult workers of ordinary competency to earn not less than 25s. per week, and to have a maximum working week not exceeding 48 hours. The stipulation "of ordinary competency" is one which might under easily conceivable circumstances lead to argument which would be anything but flattering to the "adult worker" concerned. Other duties of the Boards would include the settling of minimum rates for piecework, times for work and meals, holidays, and the regulation of apprentices and improvers—these matters being referred to in the Bill as minimum conditions of labour. The suggestion is that such decisions as are come to by the Boards should be made the subject of an order by the Board of Trade making the conditions obligatory, in cases in which they are applicable, on all persons employing labour and on all persons employed. Penalties are provided; and there is a clause designed to deal with attempts at evasion. The method of election of Trade Boards is set forth; and it is stipulated that women shall be eligible as members as well as men. The expenses of carrying the measure into effect shall, it is proposed, be paid out of moneys provided by Parliament; and if (and when) the Bill is passed, it will repeal the Trade Board Act of 1909.

Regenerating the Basement.

There are thousands of basement houses in London and the suburbs which have fallen from the high estate of their early years; being now let out in flats, or standing with dirty windows and neglected appearance, without occupiers, and the scorn of the modern seeker after a residence. Owners of houses of this type who have lost heavily over them cannot see their way to expend the money necessary to pull down and rebuild on lines that will tempt and obtain a fair rent from a tenant. Few people care for the houses, and servants abhor three or four flights of stairs as they would do the treadmill. Cannot such houses be remodelled and refitted, at a reasonable expense, so as to make them attractive from the labour-saving point of view? Mrs. M. A. Cloudesley Brereton says they can; and in a paper read before the Institute of Sanitary Engineers last Wednesday (as reported in other columns), she described how. Into the scheme gas and coke enter largely; so that it is to the interest of gas suppliers to co-operate with landlords in making their houses fit modern requirement. That there are sanitary engineers who are behind the times in their knowledge of gas use and effects received surprising testimony at the meeting; and when it is found that such ignorance exists in such quarters, there is the demonstration that the educational work of the gas industry has yet to be carried far, and must not on any account stop.

Coal Resources.

Even with the enormous output of 1912, official figures as to which have lately appeared, it will take a very long time for the exhausting of the estimated coal resources of the world. For the twelve months referred to, the parliamentary paper tells us, the total known coal production of the world (exclusive of brown coal or lignite) was about 1100 million tons; and of this 910 million tons were mined in three countries—the United States, the United Kingdom, and Germany. This is a big record of work for one year; but those who might be inclined to feel anxiety in consequence of the rate at which coal is being removed from the ground will find facts to reassure them if they study a report on the coal resources of the world which was presented at the recent

International Geological Congress in Toronto. Particulars compiled from this are included in the parliamentary paper already alluded to. These show that of anthracite and bituminous coal the total estimated actual reserves of the world are 299,842 million tons, and the estimated probable and possible reserves (including the actual reserves of the United States) 4,029,237 million tons. Of sub-bituminous coal, brown coal, and lignite, the total estimated actual reserves of the world are 404,803 million tons, and the estimated probable and possible reserves (again including the actual reserves of the United States) 2,544,781 million tons. In both the classes of coal, the United States figures approach 2,000,000 million tons—or more than double the quantity allocated to any other country. Under the anthracite and bituminous coal, a striking feature is presented by China, whose actual reserves are estimated at 18,366 million tons, while no less a figure than 960,631 million tons is inserted for the probable and possible reserves. The actual reserves of the United Kingdom represent nearly 57 per cent. of the total for Europe; and they comprise 133,117 million tons at a depth not exceeding 4000 feet, and 6108 million tons at a depth of from 4000 to 6000 feet. The actual reserves of anthracite for this country are put at 11,162 million tons. As to the United States, they are credited with reserves of anthracite and bituminous coal amounting to 45 per cent. of the total for the world.

A Complicated Wage System.

The feared coal strike in Yorkshire is now an accomplished fact; and various industries—in addition to the one primarily concerned—are being more or less seriously interfered with. When one reflects on the machinery existing for the regulation of rates of wages and the settlement of disputes, it is discouraging to find that there is such a condition of unrest. Owing to the different circumstances prevailing at various collieries, no doubt a simplification of the wages system in vogue would be difficult, if not impossible, to accomplish; but it does seem that the present complicated method of arriving at the miners' remuneration might add to the risk of misunderstanding. It seems Sir Edward Clarke (the Independent Chairman of the Wages Board), in an award that he was called upon to make, increased the minimum wage from 6s. 9d. to 7s. 3d.; and meanwhile the Conciliation Board had agreed to advances of 15 per cent., or about 7½d. per shift. It is contended by the miners that the latter advance should be given both to men who are earning more than the minimum and to those who earn less. The colliery owners, on the other hand, maintain that it should be limited to those who earn less. In other words, their contention appears to be that, whereas the 15 per cent. increase was justified when the minimum was 6s. 9d., the poorer mines cannot afford to give it with the new minimum. Thus has arisen a dispute which has already rendered idle more than 150,000 men in connection with the collieries, and each day, by causing the shutting-down of factories, will deprive of their employment further batches of unfortunate workers who have no voice whatever in the quarrel. With the idea of trying to effect a settlement, the Joint Committee of the Conciliation Board met in London last Friday; but at the end of a long conference the proceedings were adjourned until to-morrow. In any event, therefore, it is hardly likely that work can be resumed this side of Easter. The attempt at a settlement in this way is a good sign; but perhaps a much more hopeful one is the fact that the strike is viewed with manifest disfavour in some districts—Doncaster and Wakefield, for instance. It may be that in other parts the miners are fully determined; but unwilling strikers, like unwilling fighters, must be a source of weakness to the cause they are compelled to support.

MR. JOLLIFFE'S RETIREMENT.

In connection with the retirement last Tuesday of Mr. J. T. Jolliffe from the position of Chief Engineer, Manager, and Secretary to the Ipswich Gas Company, after 27 years' service, a farewell supper was given by him to the staff and men, to the number of over 200, in the Co-operative Hall. Mr. Jolliffe presided, and in proposing the toast of "The Ipswich Gas Company" treated his audience to a sketch of the history of the undertaking—coming down to the present day, when, he remarked, "gas is sold in Ipswich at 2s. 4d. per 1000 feet—the lowest price in the Eastern Counties." In response, Sir Daniel F. Goddard, M.P. (the Chairman of the Company), also gave some historical facts, and made the welcome announcement to those present that the Directors would shortly be considering whether all their employees could not share in the profits which they were able to make. Mr. Jolliffe had, as a matter of fact, some short time ago produced a scheme for doing this. Mr. Frank Prentice (the new Engineer and Manager) proposed "The Directors;" remarking that when Mr. Jolliffe joined the Board—he has already been made a Director—it would be as perfect as possible. Sir Daniel Goddard submitted "Our Host," and spoke of the services rendered by Mr. Jolliffe to the Company, All the men at the works, he said, had spontaneously put together their money, and had bought with it a little souvenir, which they had asked him to present to Mr. Jolliffe. The gift which he handed over, amid great applause, was a massive silver salver. Mr. F. Fosdick supported the toast, and on behalf of past and present members of the staff (one subscription came from China) handed Mr. Jolliffe a handsome silver fruit stand. Mr. Jolliffe thanked them warmly for their gifts, which, he said, made him feel that he had succeeded in his endeavour to secure the respect of them all. "Our New Chiefs," was proposed by Mr. Jolliffe, and acknowledged by Mr. Prentice and Mr. George Mallett (the new Secretary).

Mr. Jolliffe commenced his commercial life at the Vauxhall Works of the Phœnix Gas Company nearly fifty years ago; and he remained there until 1873, when he went to Sunderland. His association with the Ipswich Gas Company commenced in 1887.

PERSONAL.

Mr. Charles Armitage, for thirty-four years the Engineer of the Lancaster Corporation Gas-Works, was last Thursday the recipient of an elegant silver salver from the chief officials of the Corporation. It bore a suitable inscription.

Mr. John J. Jervis retired from the position of Secretary of the Swindon United Gas Company on March 1; and his post has been filled by the appointment of Mr. E. George Vince, who has been the Accountant to the Company for about thirty years.

We understand that Mr. Laurence Hislop has tendered his resignation of the office of Secretary and Treasurer of the North British Association of Gas Managers, and that a special meeting of the Committee is to be held to-morrow (Wednesday) to consider the position.

The many friends of Mr. Robert Beynon, the Engineer of the Torquay Gas Company, will regret to hear that he recently had to undergo an operation for appendicitis. He is now, however, making good progress towards recovery, and hopes to resume his duties shortly.

Mr. Alec E. Whitcher, the Manager of the Tichfield Gas Company, has been appointed from some fifty applicants to the position of Manager and Secretary of the Hawkhurst Gas Company, also to act as Consulting Engineer to a neighbouring Gas Company. Mr. Whitcher is the son of Mr. T. H. Whitcher, who has for many years been connected with the Gosport Gas Company. He takes up his new duties early next month.

At a meeting of the West Bromwich Town Council last Wednesday, the Mayor (Mr. C. S. Bache) presented Mr. H. E. Copp with a copy of the Council's resolution engrossed on vellum and framed. The resolution stated that the Council "desire to record their high sense of appreciation of the services Mr. H. E. Copp has rendered to the borough in the office of Engineer and Manager of the gas undertaking, which have proved, and will prove, to be invaluable for its prosperity and welfare, and to express their appreciation of him and of the manner in which he has discharged his duties during the last 12½ years." His Worship said that during the time Mr. Copp had been Manager of the gas-works, he had brought them up to a state of great efficiency. He hoped that his future work would be as happy and as successful as had been that at West Bromwich. Mr. Copp said he felt somewhat at a loss to express his appreciation of the signal honour that had been conferred upon him. But he assured them that he sincerely valued their present. He had spent some of the happiest years of his life in West Bromwich; and he thanked the Mayor very sincerely for his expression of good wishes for the future.

Eastern Counties Gas Managers' Association.

The fifty-first general meeting of the Association will be held at Lowestoft on Friday, the 24th inst., under the presidency of Mr. Thomas Goulden, the Chief Engineer of the Gas Light and Coke Company. Two papers are included in the programme received from the Hon. Secretary, Mr. Joseph Davis, of Gravesend. The first is by Mr. W. B. Farquhar, of Ilford, on "Present-Day Requirements for Gas Consumers," and the second by Mr. John Carter, of Lincoln, on the "Treatment of Prepayment Consumers"—an extension of the paper he originally intended to read, on "Slot-Meter Collection." The formal business will consist in the election of new members, the reception of the report of the Committee and passing of the Treasurer's accounts, and consideration of the question of district meetings of the British Commercial Gas Association. The members and friends will take lunch and dine at the Royal Hotel. On the following day (Saturday), the Chairman and Directors of the Lowestoft Gas and Water Company, through their Engineer, Mr. Joseph Hawksley, have invited the members to visit their new water-works.

NOTES FROM WESTMINSTER.

THERE was a slackness about things in the Committee rooms last week; and the deserted state of the corridors was the evidence of an approaching holiday break. We have been hearing from Dr. Leonard Hill about the monotony of the atmosphere of the Chamber of the House of Commons; but there is a double sort of monotony sometimes about the two long lines of rooms ordinarily devoted to Committee work. Last week supplied an example.

Calorific Power.

The date has been fixed upon which the Lords Committee, who are to consider the Gas Light Company's Bill, are to commence their sittings. It is the 28th inst., so that about the end of the month we shall learn their decision, and know better where we are upon the question of the calorific value standard and test—that is to say, providing the Bill then goes forward unopposed through the House of Commons, or, if opposed, providing the Committee of that House to whom it is referred do not see fit to make any alteration in the terms. With the settlement of this question, quite a number of Bills that require adjustment or confirmation on this one point will be released and at liberty to proceed on their way to the final stages. Meantime, the Local Legislation Committee have allowed the calorific clauses in the Bill through which the Middlesbrough Corporation are asking for the confirmation of an agreement for the purchase of the North Ormesby Gas Company's undertaking, the area of which is now included in the administrative area of the Corporation, and for power to purchase crude coke-oven gas. The section of the "Omnibus" Bill dealing with these matters has gone through; but we still hope, for the sake of uniformity, that the calorific clauses will be altered from "calories net" to "B.Th.U. gross."

Deal and Walmer Bill.

Three whole sittings of Sir Harry Samuel's Committee have been devoted to the Gas and Electricity Bill promoted by the Deal and Walmer Gas Company. The Committee meet again to-day; and it will be a surprise if the Bill does not have to go over until after the Easter Holidays, as an intimation by Sir Harry indicates that the Committee are proposing to prolong the short respite from parliamentary duties that the Government, hard-pressed for time, have allotted to the House generally. Things being slack in the Committee rooms, Counsel and witnesses were free on the Deal and Walmer Bill. Small detail was hammered out with right good will; and those gentlemen who were deeply solicitous over the gas consumers in the Company's area being injured by the Company taking upon themselves electricity supply, did not seem profoundly concerned about saving the gas consumers in the area a heavy bill of costs on parliamentary proceedings. Sir Harry Samuel and his colleagues (we sympathize with them) got a bit tired of the extraordinary lengths to which the opposition went—an opposition composed of the Deal Corporation, the Walmer District Council, the Eastry Rural District Council, and the East Kent Electric Power Company. The Company are asking for several new powers. Among them electricity supply rights, new capital, additional land for works, a railway siding, the sliding-scale clauses and a standard price, and a benefit fund. The power gas proposal will be dropped if electricity supply is authorized. Nearly all the argument, however, has been heaped-up around the question as to whether the Company shall have electricity supply powers; the lines taken by the opposition being two—first, that the Company have proved themselves unworthy of having the powers conferred upon them through what is called "bad management" (the Committee must have been tired of hearing the combination of words from opposing Counsel and witnesses); and, secondly, that the dual supply in the hands of the Company would have the effect of preventing competition. Both are old stories now in the Committee rooms.

The So-Called "Bad" Working.

Considering the small size of the Company, they do not appear to have done very badly by the gas consumers. The fact of the matter is that, in these local authority oppositions, far too much is made of the so-called "bad" working of small concerns. The working of a large undertaking, with big opportunities from coal purchase to business in gas and residuals, cannot be taken as a standard for the smaller concerns. Mr. E. H. Stevenson, from the opposition side, freely admitted that the price charged for gas was a "moderate one;" adding, however, that it ought to have been reduced, "having regard to the low capital expenditure, which showed that sums had been taken from revenue in the past for capital purposes—thus depriving consumers of a reduction of price." The same witness also pointed out that, although the present consumers are getting the benefit of a great deal of this capital expenditure out of revenue, the consumers in the past had lost by the transaction. This is a poor—a very poor—point to make, having regard to the present and future interests of communities in relation to gas supply. The point, in making up a case, may be all very well for a Committee of laymen in gas affairs; but professional gas men (or most of them) know the inestimable value of a low capital account. We have not troubled to see by how much the consumers in the past have been affected by any proceeding of the Company in this respect. But following up Mr. Stevenson's argument, what is found?—that consumers who have been fortunate enough to live to the present time are being recompensed by the "moderate price." Those who are dead do not care a jot about the matter; and Mr. Stevenson need not worry his head about them. We could point to gas undertakings—Mr. Stevenson, if he cared to do so, could also point to one or two, perhaps more—where the line of policy has not been followed that he attributes to the Deal and Walmer Company, and where capital expenditure has been piled up, and the price of gas to the consumers is high, though the concerns have a larger output than the Deal and Walmer Company. It is remarkable what one can sometimes find by looking around. Moreover, if the coal dues, equal to 2·13d. per 1000 cubic feet, that the Deal and Walmer Company have to pay (referred to in the evidence of Mr. William Cash for the Company) were removed, then the price of gas to the consumers could be further reduced. Among other points in the attributed "bad management" of the Company is the make of gas. This perhaps might have been better, and will be when the present antiquated carbonizing plant is replaced by something of a more modern order. But when a Company of the size of this one are selling gas, under a 15-candle standard with the old testing provisions, at 3s. 3d., less 5 per cent. discount to large consumers, are paying maximum dividends, and have a good reserve—well there is not much fault to find with the management. A point of interest is that the Company have been using a "fair quantity" of Kent coal; and the yield is not found so good as with Durham coal. But yield and price delivered must be considered together. A mixture of the coal with Yorkshire coal is found to give far better results. But apparently there are different qualities of Kent coal, looking at the varied experience as to yield, as indicated by the evidence adduced by Mr. Percy Griffith.

Lame Opposition to Electric Supply Powers.

The greatest discussion was over the question of the effect of giving the Company electricity supply powers. The local authoritities appear to be against the granting of the powers, and so are the East Kent Power Supply Company. But the fantastical thing about the whole of the opposition is that all those who are hostile to the Gas Company securing electric supply powers have had such powers themselves, have allowed them to lapse, or have not exercised them. The Sandwich, Deal, and Walmer Electric Supply Company have an Order; but they have done very little with it. The Gas Company propose buying them out, and relieving them of their obligations—obtaining complete powers through the present Bill. Let us speak plainly. The whole of this opposition to the Gas Company obtaining electricity supply powers is a pure farce; the whole facts, past and present, showing that there is no one else in the field who can give a supply with the same economy as the Gas Company. We have not much sympathy with cases constructed wholely and solely for the Parliamentary Committee Rooms, without reference to the local good. There are people in the locality who want an electricity supply; the local authorities have not responded; Mr. W. H. Patchell, late Engineer of the Charing Cross (West End and City Electricity Supply Company), and Mr. A. E. Brooks, the Engineer and Manager of the Ascot Gas and Electricity Company, both say that no one is in a position to afford the supply in the district so economically as the Gas Company. The opposition set the advantages of competition against the advantages of economy; but experience shows that, in areas that are not of an extraordinary character in the opportunities for the two supplies, the gas company with the dual supply can do better for all concerned than where there are two undertakings in opposition. What is the good of having competition between two concerns, if the district is not one from which the two can make a proper living, while one concern can, according to its circumstances, economically work the two businesses? The opponents were also solicitous for the consumers, and asserted that, in this area, an electricity supply concern could not pay its way for a few years, and so the gas consumers must suffer if the Company had the power of electricity supply conferred upon them. The illogical attitude of the opposition is quite entertaining. If the Gas Company cannot, with its superior economic position, make the electricity concern pay, then, forsooth, not one of the local authorities could do so, and the losses would have to come upon the ratepayers, the greater part of whom are gas consumers. The chances are that the first few years' losses would be greater with the local authorities running a separate concern; so that the gas consumers, as ratepayers, would be worse off than under the Company. The point that the Company would not do anything with their electric supply powers if granted was settled by Mr. Honoratus Lloyd, K.C., promising, on their behalf, that they would not oppose the revoking of the powers if in two years they had not laid electric cables. We have yet to learn the upshot of this overstrained opposition.

Water Supply Points.

There has not so far been much this session in the way of contest over Water Bills, or sections of local authority Bills dealing with water supply. What there has been has not been largely concerned with general principles, but chiefly with local matters. It may be recorded here that the two water measures from Mexborough—one by the Water Company for additional

powers, the other by the District Council for compulsory purchase—are no longer in opposition. The parties have come to an agreement regarding transfer; and the Council's Bill therefore proceeds. Mr. C. E. Baker (of the firm of Parliamentary Agents to the Council) states that the Company's Bill is in suspension at the moment, as the Council may desire some of the powers that it contains. When the Abertillery and District Water Board Bill was before a Lords Committee, the only point raised affected private fishery rights; but the evidence was not strong enough to induce the Committee to see that there was any need to interfere with the proposals of the Board. In connection with the Barnsley Corporation Bill, the Local Legislation Committee have had to dispose of matters affecting the charges for water. By agreement, the Corporation waived a proposed charge of 5d. for water supplied to a first water-closet. Next it seems that for fifty years or so the local authority have been charging for water on gross estimated rental, although the words in the Barnsley Local Board Act of 1862 provide for the charges being on "annual value." The Corporation now asked that the words "annual value" shall in their case be construed to mean "gross estimated rental." They also desired that the minimum rate for water supply should be 8s. 8d., instead of 5s. The opposition to the clauses came from the outer districts. It was acknowledged that the basis of charge hitherto had constituted "unconscious illegal exaction;" and the outer areas thought it time that it was ended, instead of being perpetuated, as proposed. The Committee, however, decided in favour of the Corporation. The Marquis of Bath's Committee have disposed of the Llanfaelog Water Bill (promoted by the Valley District Council of Anglesey), in opposition to which there was only one private owner—Mr. J. W. Platt, the owner of the Plas Mill and farm. The works proposed in the Bill are on the Bodsurau tributary of the Caradog River, and are required for the water supply of Rhosneigr—a rising watering-place. The cost of the works and mains is put at £22,500; and the provision of water by the scheme is estimated at 28,250,000 gallons a year. The Bill was passed; but it was decided that compensation water amounting to 56,000 gallons a day should be allowed to Mr. Platt.

ELECTRICITY SUPPLY MEMORANDA.

ALREADY the misnamed "half-watt" lamp is being dethroned by electrical people. Some weeks ago, attention was called in the "Memoranda" to a long photometrical trial that has been made of a well-known type of the lamp, during which trial it was found that it had no more title to be called a "half-watt" lamp than its predecessors in smaller units had to the claimed efficiency of 1 candle per watt. It was a reputed 1000-candle power lamp; and the highest hemispherical candle power that could be realized from it was in the region of 700 candles, and the efficiency was 1 candle per 0·75 watt. A pertinent letter appeared in the "Electrical Times" for March 26; and the five lines of the letter crisply asked of the editor information on two points. The inquiries evidently confounded him; and he declined to tread on the dangerous ground, and left the letter without a footnote. The letter read:

The "Half-Watt" Misnomer.

> We should be very glad if you could give us a definition of a half-watt lamp.
>
> We should also be glad to know whether you would not consider that an exaggeration of 40 per cent. in stated efficiency is misleading to the public.

Straight, plain, and definite as these questions are, there should have been no difficulty in answering them. Men of the electrical industry know—if they do not, men of the gas industry do—that there is no such thing as a half-watt per candle metallic filament lamp in existence; and if electrical men are not aware that the candle powers of the units are not all that they are represented to be, then they are not fully alive to their business.

Small Units.

The same paper in which the letter alluded to above appeared is no doubt disappointed with the actual performance of the deceptively named lamp, as it has been standing on the mountain top, and warning electricity undertakings of the coming of the small unit domestic half-watt lamp, without explaining how the physical difficulties are to be overcome that those who have been concerned with the development of the high-power "half-watt" lamps have discovered during their investigations, and have failed to surmount. Our contemporary thought the day of the "half-watt" domestic lamp had practically arrived when rumour reached it that in Germany a new lamp was being sold which claimed an efficency of 1 Hefner unit per 0·66 watt, or 1 British candle per 0·74 watt, and the same rumour alleged that this efficiency would shortly be raised to 1 Hefner unit per 0·5 watt. In its eagerness to be first in the British field with the tidings (glad or otherwise), our contemporary purchased some of the "new" small unit lamps for testing. The result was the same old electrical efficiency fabrication; for the lamps did not do any better than their predecessors in the metallic filament line. The results of the tests for candle power and efficiency were, our contemporary says, disappointing. One of the lamps—a so-called 50-candle power unit—gave only 34·6 mean hemispherical candle power, with a consumption of 57 watts, or an "efficiency of 1·65 watts per candle." A so-called 25-candle power lamp only gave 19·4 mean hemispherical candle power, with "an efficiency of 1·48 watts per British candle power." Our friends of the "Electrical Times" were sold. By the way, has the day not come when knowledge of these matters ought to have penetrated the offices of the "Electrical Times" sufficiently to have caused the members of its staff to avoid talking of "efficiencies" in watts per candle power? They should speak of consumption per candle power; and efficiency (in candle power) per watt or watts and per cubic foot or feet. However, our contemporary says, notwithstanding its experience, that while the "new" (?) lamp need not cause any anxiety to manufacturers or to supply undertakings in this country, it is still of the opinion that "the advent of the low candle-power half-watt lamp for commercial voltages is not so remote as many engineers on this side would like to believe." It warns the undertakings to revise their tariffs, so as to be prepared for "the inevitable slump in lighting revenue that will accompany the general adoption of the half-watt lamp for shop and residence lighting." Upon which the electricity supply undertakings might ask the "Electrical Times" to show them the real "half-watt" harbinger before being so screamingly funny over this business of the smaller unit. There is not much room in some cases for the suggested tariff revision.

Revising Tariffs.

Talking of tariffs, our friends of the electrical press appear to have overlooked the intimation of a South London Electricity Supply Company of an increase in its price per unit to 5½d., with a halfpenny discount to whole-house occupiers if they are good, and eschew all manner of utility in the shape of other illuminants. We referred to this matter last week. The Heckmondwike District Council have also decided, as from May 1, upon an increase of 5d. per unit for lighting, and an addition of 50 per cent. to the power rate. The Stockport Corporation are now increasing and regulating their prices, but in a way to the best of our belief that is novel so far as electricity supply is concerned, though there is a precedent for it in connection with gas supply. The last time the Alliance and Dublin Consumers' Gas Company were in Parliament, one of the terms of agreement with the Corporation was for a rise or fall in the price of gas, for a specified number of years, according to the rise or fall in the price of coal. No other undertaking has followed the idea in connection with gas supply, as there are factors other than the price of coal that come into account in fixing the price of gas. The proposal that the Electricity Supply Committee of Stockport has adopted is to add to, or subtract from, consumers' accounts for all classes of supply 1s. 6d. per 1000 units consumed for each 1s. variation up or down in the price of coal from the basis price of 10s. per ton. The price to long-hour lighting consumers is also to come under review when there has been a greater experience of the effect of the misnamed "half-watt" high-power lamp.

The Last Seventy.

We have been hearing a good deal from Lord Morley about "peccant" guarantees which he did not recognize as such until practically a whole Cabinet, after mature consideration, found them to be so. So many things of a peccant nature reach the domestic world from the electrical industry that it would be difficult to know just where to leave off in listing them. Electric lamps are among the misrepresentations, and so are electric radiators. It has recently been seen that at Southampton the householders with radiators on hire have been rushing them back into the Electricity Department's store—glad of any excuse to do so, though energy for them is only charged at ½d. per unit! The reason for this action on the part of users, as we have before pointed out, is asserted by the electrical people to be that the rentals for the radiators have been increased. Who can believe this, with energy at ½d. per unit, and all the nice things that are said by the electricity salesman as to the electric-radiator being a long way ahead of all other means of heating. On this subject, the electrical papers have given us another piece of eye-opening information. The number of radiators returned is 160; and there are still "about seventy on hire." That is to say, prior to the radiator ebb, there were only 230 electric-radiators in Southampton town on hire—after all the department has done to encourage their use. Electric-radiators have the bad habit of effectually advertising their own "efficiencies," which fall short of the representations of electrical literature. We have come across people who look upon electric-radiators as standing jokes.

Hoodwinking Cooker Users at Marylebone.

The low rentals charged for gas-cookers, because they are not an initially expensive class of goods, are, by Mr. A. H. Seabrook, of Marylebone, indirectly charged with being a deterrent to the adoption of electric-cookers. The Marylebone Electricity Department has been charging 15s. per quarter rental for what is called the standard size cooker. The Department cannot apparently afford to let the cookers on hire for a less sum. Ingenuity, however, is one of the most commonplace qualities in the work of the Marylebone undertaking; and so Mr. Seabrook has suggested that only 3s. 6d. per quarter be the charge to be called "rental," and that the remainder of the money be recouped by adding ½d. per unit to the price of current, and which ½d. is to be appropriated and added to the rental revenue to cover capital, fixing, and other charges. The fixed

rentals for larger and smaller sizes of cookers will be raised and lowered in proportion. Mr. Seabrook believes his little ruse will tend to popularize electric-cookers. The position under the new arrangement is that Mr. Seabrook will only receive for the standard size cooker 14s. a year in fixed rental; and he will rake-in from the units sold the balance of 46s., and anything more that he can get in the way of farthings. The 46s. represent 2208 farthings; and in a year an electric-cooker will have had a shabby amount of use that cannot boast a consumption of more than 2208 units. Supposing the users of the cookers get tired of them after the novelty has worn off, and troubles have arisen, as we know has been the case in certain instances, how is Mr. Seabrook to guarantee that there will be no loss to the department on account of capital and other expenses?

Newmarket Tips and Results.

We remember how, at succeeding meetings a time ago of the Newmarket Electric Supply Company, there was—until the Chairman (Mr. F. E. Gripper) and the Engineer (Mr. F. A. Simpson) found themselves in a tight corner to explain just what they meant—a lot of small talk as to the "poisonous" fumes from gas, and much else that was not a credit to the chemical intelligence of those who assisted in the circulation of defamatory rubbish of the kind, with the view to injuring the business of a statutory trade rival. Despite the evil character ascribed to gas, Newmarket still exists. Its people are as lively as ever, and patronize the Gas Company with greater freedom than before. There was another incident. Someone interested in electricity who issued a certain circular or bill derogatory of the interests of the Gas Company in connection with the public lighting contract stood, had he been discovered, in a good position for learning at a cost a little more about the law than he evidently knew before he started the publication of his libellous statements. When these matters are all remembered, they add to the interest of the report of the recent proceedings at the annual meeting of the Electricity Company. Mr. Gripper, in his speech, boasted that during the past year the equivalent of 1918 33-watt lamps had been added to the mains; but it is manifest that the average consumption of current per consumer is falling off, seeing that last year the revenue from the sales was only £63 more, while the expenditure was £76 more. Mr. Gripper attributes the small increase in revenue to the fact that their old consumers are now using metallic filament lamps. But later on, he stated that "the effect of the metal lamps was gradually wearing off, because the large bulk of the consumers had *already* adopted them, and they had not much further loss to expect from that cause." As the consumers have "already" adopted metal filament lamps, and would have been late in the day had they waited until 1913 before doing so, the shareholders must look beyond the metallic filament lamp for the cause of the increase in revenue having such a starved appearance. Then we understand from the report of the proceedings that the Company have no available reserve fund; the money upon which that title is playfully bestowed being absorbed in the business. It also appears that the Directors have not received any fees up to the present time—the finances of the concern evidently not permitting. One of the Directors who says he "thinks" he has "five" shares in the Company (£50) has lately been seeking for a signature to a notice of motion that fees be henceforth paid to the Directors. Apparently his benevolent intention was misunderstood, as there was no motion to that effect at the meeting. The shareholders after years of trading are only getting a 4 per cent. dividend. In short, the Company financially appear to be living very closely from hand to mouth. And this after the reflections upon gas which, with gramophone-precision, the Chairman and Engineer a time ago gave from the electrically published stock of points designed to slander gas. The people of Newmarket were evidently not much impressed by them.

Metal Filaments in Public Lighting.

There is a matter that rather worries the Chairman of the Newmarket Electricity Company; and it is that the Gas Company, despite all that was done to traduce gas when the new public-lighting contract was under consideration, obtained a ten years' contract. He seems to have some doubts as to whether, with gas-burners and mantles, it is possible to maintain the candle power of the lamps, while he believes that with metallic electric lamps it is possible. He ignores the facts that the candle power of metallic filaments does vary with voltage and that the process of depreciation of the filaments commence shortly after they are put into use, which process cannot be arrested, but necessitates the complete renewal of the lamps. However, Mr. Gripper points out that "stringent" clauses have been inserted in the contract with the Gas Company for maintaining the candle power. What can be more satisfactory? What more an evidence of the confidence of the Gas Company that the candle power can be maintained? The question of effective public lighting is not altogether centred in the candle power of the source of the light. The miserable lighting of streets by single metallic filament units owing to the want of diffusion, has led many an electricity undertaking to increase the size of the units. We have on previous occasions referred to instances of this in London. There has lately been an amount of public dissatisfaction with the street lighting by metallic filament lamps at Hastings; and small wonder, seeing that there are 690 55-watt lamps rendering such service as they are capable of, and 100 80-watt lamps. Some of the latter, we believe, have been adopted owing to that rare occurrence electrical remorse. But has anybody ever measured the candle power in the streets of these 55-watt lamps? The average of a very large series of photometrical tests of metallic filament lamps of all brands gives an efficiency of only 1 candle per (to use a round figure) 1·5 watts; so that the 55-watt lamps in Hastings streets would not be more than of 36-candle power.

The Hastings Plot.

There is no cause for marvel then that the 55-watt lamps, with their poor distributing power as well as candle power, do not in Hastings gain in public favour as street illuminants. An inverted gas-lamp, consuming 2½ cubic feet per hour, would do much better. It seems that either the electrical conscience has been again pricked, or else the Electricity Department is playing a game for its future benefit. Hitherto the 55-watt lamps have been charged at £3 5s. 8d. per annum; and the 100 80-watt lamps have been charged at the same price. The Electricity Committee have lately recommended that the 55-watt lamps should be charged at £3 2s. 2d., and the 100 80-watt lamps at £4 10s. The idea is that the revision will bring the charges uniform with the gas-lamps. This is a definite acknowledgment that the price of the electric street lamps has been more than the equivalent of the gas-lamps; but even now there is a discrepancy. Single burner incandescent 50-candle power gas-lamps (not 36-candle power ones) have been charged at £3 2s. 2d. since 1909, as against the single 55-watt electric-lamp at £3 5s. 8d. The 80-watt electric-lamps electrically called a 70-candle power one—fie! fie!! Mr. Ferguson—have also been charged at £3 5s. 8d. each; and these are now to be charged at £4 10s. For a 100-candle power gas-lamp, the borough pays £4 2s. 6d.—not £4 10s. for a "70"-candle power one. Where then comes in equality? Ratepayers are still paying more for equal power—as they have been doing for years past, after having to discharge the cost of conversion from gas to electricity. These are (so it is said) days of plots—political and otherwise. We rather fancy there is a plot in this change of prices at Hastings. The 55-watt electric-lamps are not going to satisfy for ever; and there will sooner or later have to be a change to nothing less than the 80-watt type, which will be charged out at £4 10s.—for about an actual 55-candle power—instead of £3 2s. 2d. By the conversion of every one of these lamps, the Electricity Department will net £1 7s. 10d. above the £3 2s. 2d., or £1 4s. 4d. above the former charge of £3 5s. 8d. The Hastings Council are not so wide awake as their Electrical Department. Some members would be the better for having their wits sharpened a bit.

NOTES FROM ABROAD.

A Natural Gas Exhibition.

The importance of the natural gas industry in the U.S.A. is emphasized by the announcement that an exhibition is to be held in connection with the ninth annual convention of the Natural Gas Association of America in St. Louis on May 19 to 22 this year. The plans are already issued, and it is expected that the number of exhibitors will be considerable.

German Bye-Products.

It is reported that the German sulphate market in March was quiet. The increase in home consumption did not keep pace with the manufacture. For export purposes, the month was noticeable for specially sharp competition with England. The sales amounted to somewhat more than in March, 1913, but were insufficient to clear existing stocks. The demand for benzol and homologues remained strong, but the market was kept well supplied by increasing production. The tar products market remained unchanged.

Munich Gas Exhibition.

We have received the official programme of the gas exhibition which is to be held in Munich in July and August of this year, under the auspices of the German Association of Gas and Water Engineers, the Association of Gas and Water Officials, and the Gas Publicity Centre. All ordinary applications of gas are to be represented; the two most striking divisions in the list of exhibits being the "Possibilities of a Cubic Metre of Gas for Light, Heat, and Power," and "Gas in Aerial Navigation." Lectures and cinematograph displays on all branches of the industry are to be given.

Discs in Prepayment Meters.

Our contemporary "The Gas Record" in its current number comments on the trouble that "many" English gas companies have been experiencing with discs which are put into prepayment meters instead of coins. They ask if it can be that English gas companies are "coming to the point where telephone slugs (discs), with grooves and notches, must be employed to protect their prepayment meters." The article concludes: "It would seem that England is lacking in two important items: Yankee invention, and honest gas consumers." We do not know telephone "slugs," but we would suggest it seems that America is lacking in honest telephone users; and further, in these notes last week we men-

tioned the case of an American gas consumer who bye-passed his meter for seven years, and then died without being detected. Is this exactly honest, and does this imply that America is entirely "lacking" in honest consumers?

Avoiding Nuisance from Oven Discharging.

In 1913 a special installation was fitted to the coke-ovens of the Mansfeld Colliery (Germany) for rendering innocuous (by an exhausting system) the smoke and fumes escaping during the charging and discharging of the ovens. The trial installation having proved quite successful, the system is to be extended to the whole of the 220 ovens, at a cost of some £2000. A special feature of this system is that the particularly noxious yellow gases, which generally escape when the ascension pipes are being cleaned out, are as easily exhausted and burnt-up as those which escape during charging and discharging.

Spontaneous Combustion of Coal.

An article appears in "Feuerungstechnik" (April 1) on this subject, by F. W. Hinrichsen and S. Taczak. The conclusions at which the authors arrive are that coal deteriorates when stored in the open, owing to the action of oxygen and moisture on unsaturated hydrocarbons present in the coal. The heat developed by this action is apt to lead to ignition of the coal. Coke and anthracite are not affected in the same way owing to the absence of such unsaturated compounds. Spontaneous combustion can also be brought on by other causes, such as fermentation, size of the lumps, manner of heaping, and other circumstances, such as the proximity of boilers.

Canadian Meter-Works Gutted.

It seems that a meter-works of all places ought not to have been the scene of such a fire as recently gutted the plant of the Dominion Meter-Works of Canada, causing damage estimated at close on £2000. A frozen-in meter was being thawed by means of a gasoline torch, which melted the solder of the meter, and naturally ignited the escaping gas. Even then serious damage might have been averted had the gas-main been better equipped with cut-off valves. As it was, the only means of stopping the flow was by a stop-cock at the side of the meter, in the hottest part of the flames. Before the firemen were able to reach this in safety, the damage had been done. This seems to be another example of the badly shod cobbler.

Control of Small Gas-Works.

In a paper on this subject read before a recent meeting, in Dantzic, of the Baltic Association of Gas and Water Engineers, Herr H. Menzel especially recommended to those in charge of such works a constant free interchange of ideas with neighbouring works, visits to Association meetings, and careful study of current technical literature. Working and financial accounts should be made out in careful detail, to enable comparison to be made with other undertakings. For spreading the use of gas to its utmost limits, the small undertakings are recommended to the Gas Publicity Centre, which is the equivalent of the B.C.G.A., and whose help, says the author, is absolutely essential.

A Large Otto Coking Company in America.

The Otto Coking Company—a corporation formed to operate in the United States—have taken over the organization, assets, and goodwill of the Schniewind Coke-Oven Company, the United Coke and Gas Company, the German-American Coke and Gas Company, and the American Coke and Gas Construction Company. The new Company is controlled by the interests in Dr. C. Otto and Co., of Dahlhausen-on-the-Ruhr, and the Otto Bye-Product Coke Company, of Leeds. The object is to develop in America the employment or use of the Otto regenerative bye-product coke-oven, with direct recovery of ammonia, tar, and benzol. We learn that the new Company begin active business with a contract for the immediate construction of plant for the Buffalo Bye-Product Coke Corporation, at Lackawanna (N.Y.), a busy settlement close to Buffalo; and that negotiations are in progress for the erection of three other plants.

Room for Improvement.

At the eighth annual meeting of the Ottawa Light, Heat, and Power Company recently held, it was reported that a dividend of 8 per cent., and two bonuses of 1 per cent. each, had been paid during the year. Truly remarkable, considering the state of affairs, are the figures shown by the Berlin (Ontario) Light Commission, which has had an average yearly increase in gas sold of 13 per cent., and a total from 1904 to 1913 of 297 per cent. But unaccounted-for gas is on the increase, and last year reached the high figure of 19·3 per cent. The extraordinary reason put forward for this is that the gasholder, which has a capacity of only 38 per cent. of the maximum daily output, is often filled up in the early morning and allowed to blow! It seems, therefore, high time that new storage was added, and it is announced by the "Intercolonial Gas Journal of Canada" that an "immense" holder of 350,000 cubic feet is to be added. When we consider that only recently Messrs. C. & W. Walker have obtained the contract for a 12,800,000 cubic feet holder for Sydney, and that New York can even go one better than this, 350,000 cubic feet does not seem immense. It will be interesting to note the results of the undertaking when gas is no longer passed straight from the holder to the air.

COAL PRODUCTION OF THE WORLD.

Board of Trade Statistics.

As compared with the immediately preceding return of the series, the annual White Paper known as the "Coal Tables" makes its appearance on the present occasion over two months late—an important matter, when it is borne in mind that the figures now given refer to the year 1912. The report (which is made by the Department of Labour Statistics of the Board of Trade, and bears the signature of Mr. F. H. M'Leod) deals with the coal production and consumption of the principal countries of the world; and there are also given figures as to imports and exports of coal, as well as statements showing the production of lignite and petroleum in the chief producing countries. There are also particulars with regard to the number of persons employed in mining, the value of the coal produced, &c. Among the information to be gleaned from the tables is the amount of coal consumed in the manufacture of gas, the production of coke, and the quantity of coal used for locomotive purposes and in the production of pig iron.

PRODUCTION AND PRICES.

For the year 1912, the total known coal production of the world (exclusive of brown coal or lignite) was about 1100 million tons, as compared with 1050 million tons for the previous twelve months. The quantity raised in the United Kingdom, of course, showed a falling off, on account of the national strike of miners. Nearly five-sixths of the total output was produced in the United States, the United Kingdom, and Germany; the next three countries in importance in this respect (though a very long way behind) being France, Russia, and Belgium. In Germany, France, and the United States, the output in 1912 exceeded that of any previous year. Regarding both the first and the last-named, the increase was a heavy one. As a matter of fact, the production of the United States exceeded that of the United Kingdom by over 83 per cent.; while the output of Germany was about two-thirds that of this country. The aggregate output of the six principal countries was about 1000 million tons, as against 950 million tons for 1911. The figures for the past three years are as follows: United States—1910, 447,854,000 tons; 1911, 443,189,000 tons; 1912, 477,202,000 tons. United Kingdom—1910, 264,433,000 tons; 1911, 271,892,000 tons; 1912, 260,416,000 tons. The last-named figure excludes some 2¼ million tons of dirt raised with the coal, which would have been included had the returns been made in the same manner as hitherto. Germany—1910, 148,645,000 tons; 1911, 156,033,000 tons; 1912, 172,065,000 tons. France—1910, 37,030,000 tons; 1911, 37,902,000 tons; 1912, 39,745,000 tons (provisional). Belgium—1910, 23,532,000 tons; 1911, 22,683,000 tons; 1912, 22,603,000 tons. Russia—1910, 24,460,000 tons; 1911, 25,998,000 tons; 1912, the figures are not yet available.

In spite of the larger total output of the United States, the production in proportion to the population is still greatest in the United Kingdom, with an average of 5·7 tons per head. In the United States, it was 5 tons, Belgium 3 tons, Germany 2·6 tons, and France 1 ton. The total number of persons employed in the coal-mining industry is again greatest in the United Kingdom, where the number employed in 1912 was nearly 1,069,000, of whom 862,000 were employed below ground. The total figures for the other principal producing countries, for 1912, are as follows: United States, 723,000; Germany, 611,000; France, 199,000 (provisional); Belgium, 146,000. The average output per person employed has decreased in the United Kingdom from 292 tons in 1906 to 260 tons in 1911, and 244 tons in 1912. The last-named figure, of course, was largely influenced by the strike. The United States was first with an output of 660 tons per person employed; the other figures being: Germany, 269 tons; France, 200 tons (provisional); Belgium, 155 tons. It is, however, pointed out that the average output per person in different countries or at different dates is affected by variation in the accessibility of the seams, in hours of labour and regularity of employment, and in the methods of operation.

Turning to the financial aspect of the tables, it is learnt that the variations in the average value of coal at the pit's mouth in the United States have been comparatively small in recent years; the figures since 1901 having (with the exception of one year) ranged between 5s. 6½d. and 6s. 1d. per ton. There was in 1911 a fall of ½d. per ton in the United Kingdom and of 3d. per ton in Germany, and a rise of 1¾d. per ton in France and in Belgium, as compared with the preceding year. In 1912, the average value at the pit's mouth in the United Kingdom was higher than in any year since 1901, and 11d. per ton more than in 1911. Of this 11d., however, 1d. may be accounted for by the exclusion of the dirt, as already alluded to. The average value in 1912 was higher than in 1911 in Germany by 7¼d., in France by 3¼d., and in Belgium by 1s. 5½d. per ton. The following are the figures for the last two years, although they do not, of course, all refer to coals of the same quality. United Kingdom—1911, 8s. 1¾d.; 1912, 9s. 0¾d. Germany—1911, 9s. 11d.; 1912, 10s. 6¼d. France—1911, 12s. 5¼d.; 1912, 12s. 8½d. (provisional figure). Belgium—1911, 12s.; 1912, 13s. 5½d. United States—1911, 5s. 10¾d.; 1912, 6s. 1d.

A glance at the section furnishing particulars as to the chief parts of the British Empire shows that in only three cases does the annual output exceed 10 million tons. British India came first in 1912 with 14,706,000 tons, then the Dominion of Canada with 12,958,000 tons, and the Commonwealth of Australia with 11,730,000 tons. Other substantial producers were the Union of

South Africa, 7,248,000 tons, and the Dominion of New Zealand 2,178,000 tons. These figures constitute records in each case but New Zealand. The increases over the figures for 1911 were more than 2¾ million tons in Canada, and nearly 2 million tons in India; while in Australia the increase amounted to over a million tons, and in South Africa to nearly half-a-million tons. In the year under review, the output per head of the population amounted to 2½ tons in Australia, 2·1 tons in New Zealand, 1¾ tons in Canada, and 1·3 tons in South Africa. The average value of coal at the pit's mouth in the different parts was: British India, 4s. 6d. per ton; Australia, 7s. 6½d.; New Zealand, 10s. 11¼d.; Canada, 11s. 5¼d.; and South Africa, 5s. 6¼d. In India, South Africa, and Australia the average value of coal produced was lower, and in New Zealand and Canada higher, in each of the years 1910 to 1912 than in this country.

Imports and Exports.

An important section of the report is that dealing with imports and exports of coal. The foreign countries which export coal in excess of the amount they import are Germany, the United States, and Japan; while the United Kingdom, Australia, South Africa, and British India are in the same catagory. The excess of exports over imports in 1912 was as follows: United Kingdom, 85,634,000 tons; Germany, 31,324,000 tons; United States, 25,054,000 tons; Japan, 5,414,000 tons; Australia, 3,807,000 tons; South Africa, 1,356,000 tons; and British India, 147,000 tons. The exports from the United Kingdom showed some falling off as compared with the previous year, which was a record; but the decrease is almost entirely accounted for by the somewhat smaller quantity of bunker coal shipped for use on steamers. Exports from Germany and the United States have been increasing for several years; those from Germany showing an increase of over 6 million tons in 1912 compared with 1911. The United States exports were up by nearly 1¼ million tons. Including bunker coal, the total quantity of coal exported from the United Kingdom during 1912 was 85,843,000 tons, compared with 87,081,000 tons in 1911. Excluding coke, patent fuel, and bunker coal, the exports from the United Kingdom in 1912 were 64,444,000 tons, and in 1911 64,599,000 tons. The imports of coal into Germany amounted in the year under review to 11,347,000 tons, more than three-fourths of which was obtained from the United Kingdom. As usual, the principal coal-producing foreign countries which imported coal in excess of the amount they exported were Russia, Sweden, France, Belgium, Spain, and Austria-Hungary. In the British Empire, Canada and New Zealand come within the same category.

The figures given for the consumption of coal—which are arrived at by adding the imports to the home production, and deducting the exports—show that the total consumption of coal in the United States is still considerably more than twice as great as that in the United Kingdom, which has the next largest consumption. The figures for the United Kingdom showed a lower consumption in 1912 than in any of the five previous years; the reduction amounting to 10 million tons compared with the figures for 1911. The chief coal-consuming countries last year, with the approximate amounts used, were: United States, 459,488,000 tons; United Kingdom, 174,782,000 tons; Germany, 140,741,000 tons; France, 58,624,000 tons (provisional). The coal consumption in the United States is also greater in proportion to the population, as well as absolutely, than in the United Kingdom. The consumption per head for different countries, in 1912, is given as follows; but in considering them it has to be remembered that in some countries a large quantity of fuel of other sorts is used: United Kingdom, 3·83 tons; United States, 4·82 tons; Belgium, 3·35 tons; Germany, 2·12 tons; France, 1·48 tons (provisional). The quantity of coal consumed for locomotive purposes during that year in the United Kingdom was 12,636,173 tons. Of the coal consumed in this country for all purposes in 1912, 99·88 per cent. was of native production, and in the United States, 99·61. The quantity of British coal imported into Germany was nearly 9 million tons, which was somewhat less than in the preceding twelve months.

The output of lignite in 1912 amounted to 79,634,000 tons in Germany, and to 25,861,000 tons in Austria. The figures for the United States are not separately given. With regard to petroleum, the total production in the United States was 7771 million gallons, as compared with 7713 million gallons in 1911. The oil-fields of Russia yielded 2337 million gallons, which was an increase of 63 million gallons. The combined output of Germany, Austria, Roumania, Japan, Mexico, Peru, Canada, British India, and the Dutch East Indies was 2103 million gallons. In the report of the United States Geological Survey, the aggregate world's output of petroleum in 1912 is estimated at 12,286 million gallons.

Coal Used by Gas Undertakings in the United Kingdom.

The total quantity of coal carbonized by gas undertakings in the United Kingdom each year from 1907 to 1911 inclusive was:

—	1907.	1908.	1909.	1910.	1911.
	Tons.	Tons.	Tons.	Tons.	Tons.
Companies . . .	9,240,280	9,281,738	9,175,532	9,236,081	9,431,841
Local authorities*.	6,166,473	6,112,569	6,049,788	6,161,702	6,203,171
Total. . .	15,406,753	15,394,307	15,225,320	15,397,783	15,635,012

* Twelve months ended March of the years following those stated.

Coal Used in the Production of Coke.

The quantity of coke obtained at gas-works and at coke-ovens in the United Kingdom in each year from 1908 to 1912 inclusive, and the quantity of coal used, were as follows:

—	1908.	1909.	1910.	1911.	1912.
	Tons.	Tons.	Tons.	Tons.	Tons.
Coke obtained at gas-works . .	7,323,817	7,370,598	7,406,346	7,483,105	7,629,716
Coke obtained at coke-ovens . .	11,213,651	7,496,551	11,925,115	11,474,174	10,720,352
Quantity of coal used . . .	35,233,[illegible]	34,514,573	34,964,208	34,460,640	33,667,324

GAS IN THE HOME.

Good fortune favoured the organizers of the Simple Life and Open Air Exhibition and Conference in reference to the date chosen for their display this year. A few hours' sunshine made it more possible for the town-dweller to sympathetically regard suggestions of camping-out than would have been the case during the weather which for many weeks previously was experienced. For most of us the simple life must remain a dream; but that is no reason why we should not reduce complications as far as possible. We cannot, unless the climate entirely changes, live in the open air; but houses may be run on simple lines, and gas, with its labour-saving qualities and its ease of manipulation, is a means to this end.

This year the exhibition was held in the Royal Horticultural Hall, Westminster; and it was no doubt with some such reflections as the above in mind that the Gas Light and Coke Company determined to draw attention to the many advantages of gas by means of an attractive show. Incidentally, they had also an opportunity (of which they availed themselves to the full) of proving that gas is just as well suited to the cooking of those mysterious dishes beloved by the vegetarian as it is to other forms of diet. The stand was divided into four parts, each facing a different way, so that all were quite separate. The first was a reception room, with a "Sola Warwick" gas-fire, looking very effective in a green-tiled recess, with an oak overmantel. Here, as in other parts of the stall, there were some neat wall-brackets, fitted with "Nico" burners and either silk handkerchief shades or beaded fringes, and attached to pneumatic switches. A prettily designed oxidized copper pendant gave a good finish to the section. Then there was a bathroom, the bath and handbasin in which were plentifully supplied with hot water by a "Lightning" and a "Brilliant" geyser. There was here a "Davis" steamless radiator and towel dryer. The kitchen was fitted with a Fletcher No. 80 new pattern cooker, in a white and blue tiled recess. A Wright's "B.T.U." gas circulator, with thermostat shutting-down at 140° Fahr., was used for supplying hot water to the sink. The products from this apparatus are led into a flue which extends down below the inlet, to an open bottom, thus drawing in a current of air which helps to cool the flue gases. The circulator was also connected with the bath and lavatory basin, to furnish an alternative supply to the geysers; all the pipes being hidden from sight. Over the table there was a two-burner inverted Sugg light specially suitable for kitchen use, with an opal shade. In the remaining section, the work of the Coke Committee was furthered. There was shown a Keith hot-water coke-boiler, which can be connected-up with the hot-water supply system of a house at small cost. A sample bag of coke nuts, specially for closed stoves, was seen, as also a bag of broken coke in larger pieces. The charge in both cases for a 28 lb. bag is 4½d. There was on view, among others, a Humphrey gas-iron, the features of which, as well as the advantages claimed for it, were set forth in an illustrated article in the "Journal" for March 17. With them there were a Parkinson oven griller, a Richmond "Renaissance" fire, a Davis "Royal" fire, a Richmond "Bungalow" griller, and a Davis "Gilled" circulator. The general lighting of the stand was by means of eight Sugg 500-candle power inverted lamps, with obscured globes, and attached to the firm's electric switches for igniting and extinguishing.

The Company are certainly adepts in the art of securing the maximum results from an exhibit with a minimum of time spent in its preparation.

Mr. Thomas C. Tatham, formerly Chairman of the Monte Video Gas Company, Limited, whose death was recently announced, left estate valued at £36,984.

Among the arrangements of the Junior Institution of Engineers for the current month is a visit on the afternoon of the 25th inst. to the Old Kent Road station of the South Metropolitan Gas Company.

We have received from the Walther Feld Company a circular-letter stating that Herr Walter Emminghaus has been appointed Manager in place of Herr Walther Feld, whose death was recorded in the "Journal" for March 24.

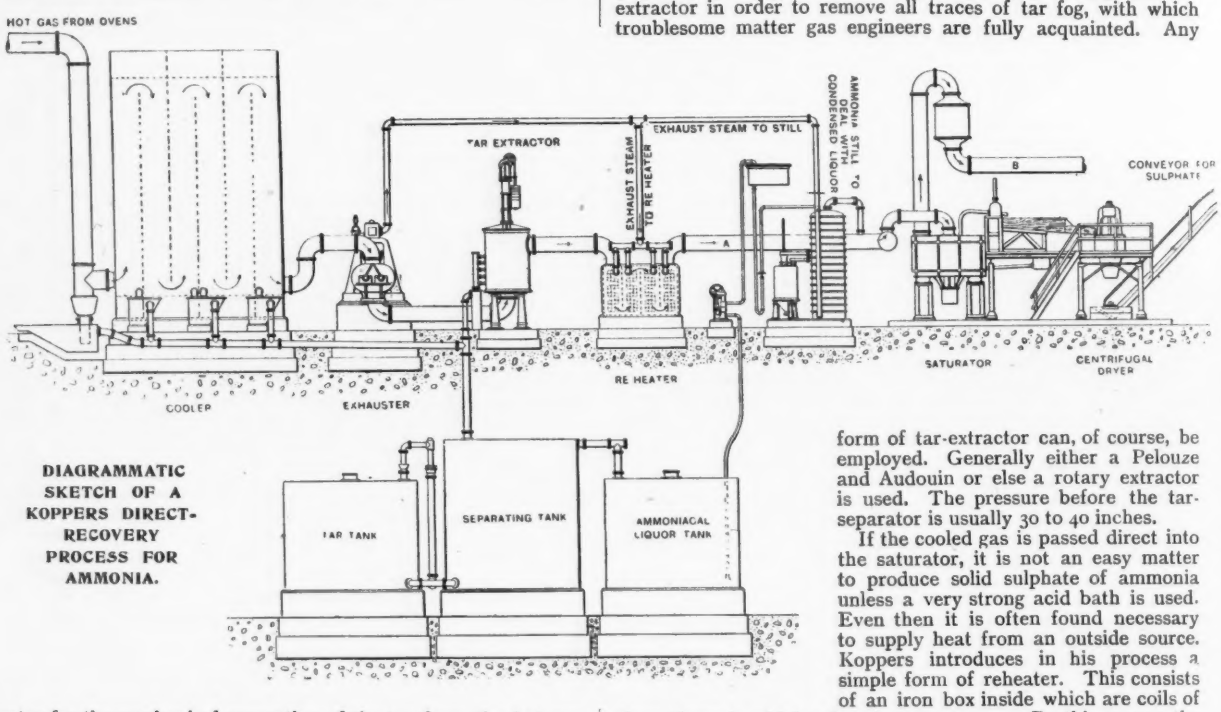
THE DIRECT RECOVERY OF AMMONIA ON GAS-WORKS.

By G. Stanley Cooper.

In an editorial note which appeared in the "Journal" for March 24, the following passage appears with reference to the direct process for use on gas-works: "We are looking forward to receiving some definite particulars from actual working. We feel that direct ammonia recovery is now within measurable distance of a larger adoption on gas-works; but what is wanted to give a fillip to the adoption are actual working details."

As the writer was responsible for the article which brought forth the above remarks, he feels it incumbent upon him to accept the implied invitation, and give a full detailed description of the direct-recovery process with special reference to gas-works practice. In order to follow out the system properly, a brief account of the historical development of the process is perhaps desirable.

About the year 1900, a German (Herr Franz Brunck, of Dortmund) attempted to pass the hot gas direct from coke-ovens into a bath of sulphuric acid. The process was a failure, owing to the fact that the tar contained in the gas was deposited in the saturator, and a dirty, unsaleable salt was produced. Further, the moisture contained in the gas was also deposited in the saturator, thereby rendering it a difficult matter to produce solid sulphate without evaporation. Brunck then introduced apparatus for the mechanical separation of the tar from the hot gas, but still found it impossible to remove all traces of tar at such a high temperature. A lower temperature was tried. But difficulties were still experienced; and the process was finally abandoned. Koppers next took up the idea, and eventually perfected his now well-known direct-recovery process, the general details of which were given in the "Journal" for March 24. Following Koppers, other inventors worked on the process, and other systems were brought out and worked with more or less success.



DIAGRAMMATIC SKETCH OF A KOPPERS DIRECT-RECOVERY PROCESS FOR AMMONIA.

In the direct process there is, of course, no scrubbing plant. Consequently there are no hydraulic main and no water-sealed dip-pipe; the gas being delivered from the ascension pipe direct into a dry main. The liquor and tar which condense there are run off into tanks and separated; so that some means must be provided for cutting off the gas collecting main from the retorts during the time the latter are being charged. This is a very simple matter; and any trouble due to oscillation or excessive or deficient seal is done away with.

The gas in the main is at a temperature of about 250° C. Upon the length and position of this collecting main and the main conducting the gas to the bye-product plant depends the amount of cooling, and hence the amount of tar and liquor condensed in this portion of the plant. In order to help to prevent the deposition of pitch in the mains, it is usual to flush them occasionally with hot tar or liquor. From this point two courses are open—either the hot process can be employed in which coolers are eliminated, and there is little condensation, or the low-temperature process installed, necessitating the employment of coolers and the subsequent distillation of the condensed liquor. There is not perhaps opportunity at this stage to go into the relative advantages of these alternative systems; but it is sufficient to say here that the latter process is far more in use at the present time than the former, and has met with complete success in every instance. As the writer is more familiar with the low-temperature process, he prefers at this stage to confine his remarks to that system.

In the low-temperature process it is contended that, in order to produce the necessary conditions for the manufacture of a clean salt, there must be an absence of tar in the gas, and the temperature must be high enough in the saturator to prevent any dilution of the acid by water condensed from the gas in order to allow of the production of solid sulphate direct and not by evaporation. It is claimed that the Koppers process fulfils these conditions perfectly; and a detailed explanation of the process, together with references to the temperatures and pressures at particular points, will enable those interested to see exactly how it might be successfully applied to gas-works conditions.

Fig. 1 is a diagrammatic illustration of the apparatus employed. The temperature of the gas at the entrance to the coolers may be anything from 150° C. to 250° C., according to the length of the conducting main, &c., as mentioned above. The gas at this point is usually under a suction of about 2 inches water-gauge. On passing through the coolers, the whole of the water vapour contained in the gas—above the saturation amount at the exit temperature—is deposited, together with the heavier portion of the tar. Hence the volume of gas, water vapour, &c., is reduced at the exit of the coolers to about half what it was at the entrance to them; and the suction of 5 to 6 inches before the exhausters requires comparatively little power to maintain. The temperature at the outlet of the coolers is usually about 25° C. The gas being drawn by the exhauster is then forced through the tar-extractor in order to remove all traces of tar fog, with which troublesome matter gas engineers are fully acquainted. Any form of tar-extractor can, of course, be employed. Generally either a Pelouze and Audouin or else a rotary extractor is used. The pressure before the tar-separator is usually 30 to 40 inches.

If the cooled gas is passed direct into the saturator, it is not an easy matter to produce solid sulphate of ammonia unless a very strong acid bath is used. Even then it is often found necessary to supply heat from an outside source. Koppers introduces in his process a simple form of reheater. This consists of an iron box inside which are coils of pipes through which exhaust steam passes. By this means the temperature of the gas is raised to about 60° C. The hot gas then passes into the saturator at a pressure of about 32 inches. The lye in the saturator usually contains from 5 to 10 per cent. of free acid.

As pointed out above, by cooling the gas to 25° C. in the first instance the amount of water vapour in it is only sufficient to saturate it at that temperature. When therefore the gas is heated to 60° C., it is capable of taking up much more water vapour; and this in fact actually happens. The gas passing through the lye in the saturator takes up moisture, concentrates the solution, and so helps the production of solid salt. After the saturator the temperature of the gas is about 55° C., and the pressure about 12 inches. The gas is now totally free from tar and ammonia; but it contains much moisture. It is therefore necessary, before further purification takes place, to cool the gas once more to atmospheric temperature, and so remove the excess of moisture. The liquor condensed in the coolers will contain probably about 15 to 30 per cent. of the total ammonia, according to the class of coal being dealt with. Practically 80 per cent. of this ammonia will be in the form of fixed ammonia salts. This liquor is subjected to distillation with steam and lime in the usual way. It has to be remembered, however, that no water whatever is used for scrubbing purposes. Hence the amount of liquor is probably only about 30 to 40 per cent. of the quantity produced in the old method, and many of the objectionable constituents are absent.

The yield of ammonia obtained by the employment of this process is probably larger than that obtained by scrubbing, as there are few channels of loss. There is less liquor to store; and this contains principally fixed ammonia compounds, which do not lose

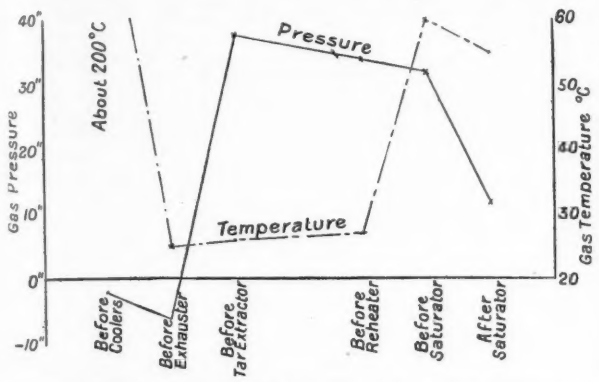


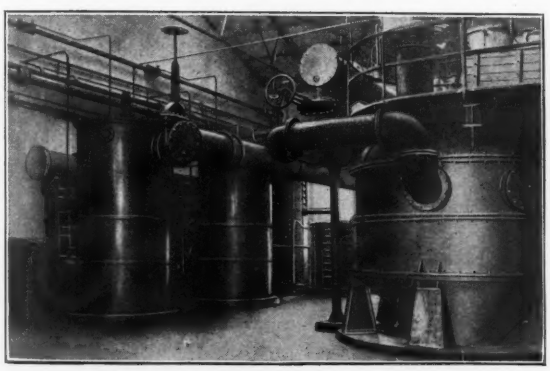
Chart Showing Temperatures and Pressures of Gas in Koppers Direct-Recovery Process.

ammonia by evaporation. In every case where the direct process has been substituted for the old system, an increased yield of ammonia has been obtained. The sulphate produced is of excellent quality, and quite white in colour. The following is a typical analysis.

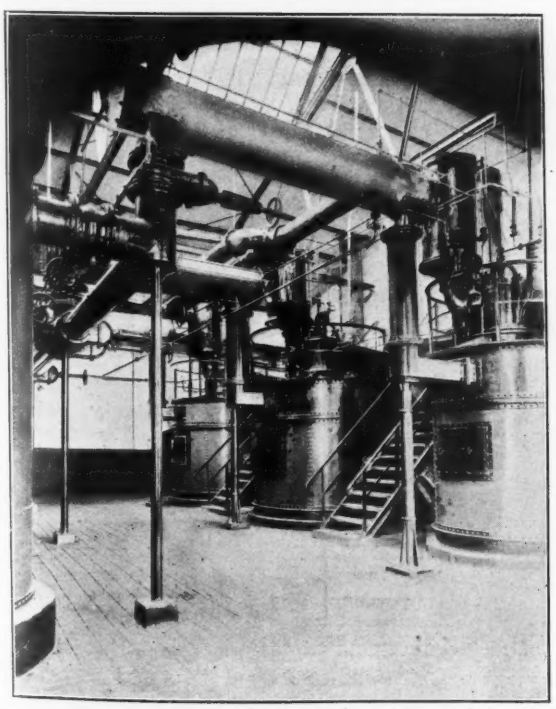
Ammonia	25·3 per cent.
Moisture	0·2 ,,
Free acid	0·3 ,,
Ammonium chloride . . .	*nil*

The costs of operating such a system as outlined above are not prohibitive. The labour required is not a great item. On a plant dealing with (say) 600 tons of coal per day, making approximately 7½ million cubic feet of gas, the labour required would be only five men per shift. Assuming a yield of 1·4 per cent. of sulphate of ammonia, the production would be 8·4 tons per day, or approximately 3000 tons per annum. For this would likely be required about 3000 tons of sulphuric acid and (say) 350 tons of lime. An ample allowance for repairs and maintenance is 2½ per cent., as, owing to the low temperature at which the system is worked and the elimination by cooling of any corrosive elements, the wear and tear is reduced to a minimum. The whole process is simple and continuous, and requires little attention; all the operations being practically automatic.

The power requirements of the plant are not great. Steam is necessary for the exhauster according to the capacity of the plant, and the exhaust steam from this source is sufficient to serve for reheating the gas before the saturator and for distilling the liquor produced.



Tar Extractors and Saturators on a Koppers Plant.



Saturators on a Koppers Plant Supplying Gas to Dortmund.

WESTMINSTER TECHNICAL INSTITUTE.

In response to an invitation issued by the Education Committee of the London County Council and the Principal of the Westminster Technical Institute (Mr. J. Stuart Ker, B.Sc.), there was a large gathering at the premises in Vincent Square, S.W., last Friday evening, to inspect an exhibition of students' work and witness demonstrations by lecturers and students. In the course of the proceedings, ample proof was forthcoming that the Institute is doing good work in many directions. The art section was particularly interesting; and during the evening Mr. George Clausen, R.A., took occasion to quote examples showing the good positions that have been attained by students. Those visitors who were of an engineering turn of mind, too, paused to examine a 22-ton testing-machine for re-inforced concrete, which had been designed and constructed in the Institute.

The classes for gas-fitter apprentices which are held by arrangement with the Gas Light and Coke Company are well known; and in this department there are over a hundred pupils. The workshop was busy on Friday, in charge of Mr. P. Smithers and Mr. J. Bevis; and some first-class specimens of work done by boys within a period of twelve months of workshop practice were on view. Class work for these apprentices was also in progress, under the superintendence of Mr. F. G. Steed. Gas-engine tests were in charge of Mr. Alwyn Meade, the lecturer in "Gas Manufacture." The engine is fully equipped for various kinds of power tests, and it is coupled to air and gas compressors, which supply air for use in the workship and gas for lighting there and for use in the furnace-room. There are four of the new Keith silica lamps in the workshop; while the adjoining furnace-room contains different kinds of gas-furnaces and pyrometers for the use of students. In addition to the engine and the furnace-room, there is upstairs another portion of the gas-laboratory; and here Mr. J. G. Clark and Mr. D. J. Winslow, who have charge of the laboratory, were exhibiting a large number of scientific instruments for demonstrating the lighting and heating properties of gas, co-efficients of reflection, and other cognate matters. All the leading types of photometer are represented; and there is a Smith radiometer, as employed in connection with the gas-fire researches at the Leeds University. Gas is a very important part of the Institute's work; and among the many visitors to the Departments referred to on Friday were Mr. Thomas Goulden, the Chief Engineer of the Gas Light and Coke Company (who is on the Advisory Committee) and Mr. D. Milne Watson, the General Manager of the Company.

A short period during the evening was set aside for speech-making, when the chair was taken by Mr. J. R. Penfold, the Vice-Chairman of the Advisory Sub-Committee, who said he did not know that there was anything quite like the Institute in the county of London. The Mayor of Westminster (Mr. Granville-Smith) remarked that the original idea, of course, was simply to make what was generally called a trade centre, in connection with certain industries which in those days flourished in Westminster; but since then the scope of activity had been widened. Westminster had become a centre of engineering; and it was in this direction that efforts had been turned. Departments had been created which afforded instruction in engineering subjects, architecture, and building construction. There was also a large gas industry; and to this, too, the management had given attention. Classes had been instituted by means of which gas-fitters were trained in a thoroughly practical manner to do their work well and intelligently. Among all the institutions with which he had come in contact in his time, he could not call to mind one which had enjoyed such signal success as the Westminster Technical Institute. The Mayor and Chairman were thanked for their remarks, on the proposition of Lady St. Helier, seconded by Mr. Isidore Salmon.

Gas-Meter Testing in New Jersey.

In New Jersey there is in force an Act establishing a uniform standard of weights and measures. A supplementary Bill has now been introduced into the Legislature under which the testing of gas-meters must be done by the Weights and Measures Department. Should it become law, every gas-meter in the State would have to be tested and sealed before Jan. 1, 1915, and the companies required to pay $1 for each one tested—the test to hold good for three years. Consumers are to be allowed additional tests upon payment of a fee.

DRIVING COAL BREAKERS AND CONVEYORS—see p. 25.

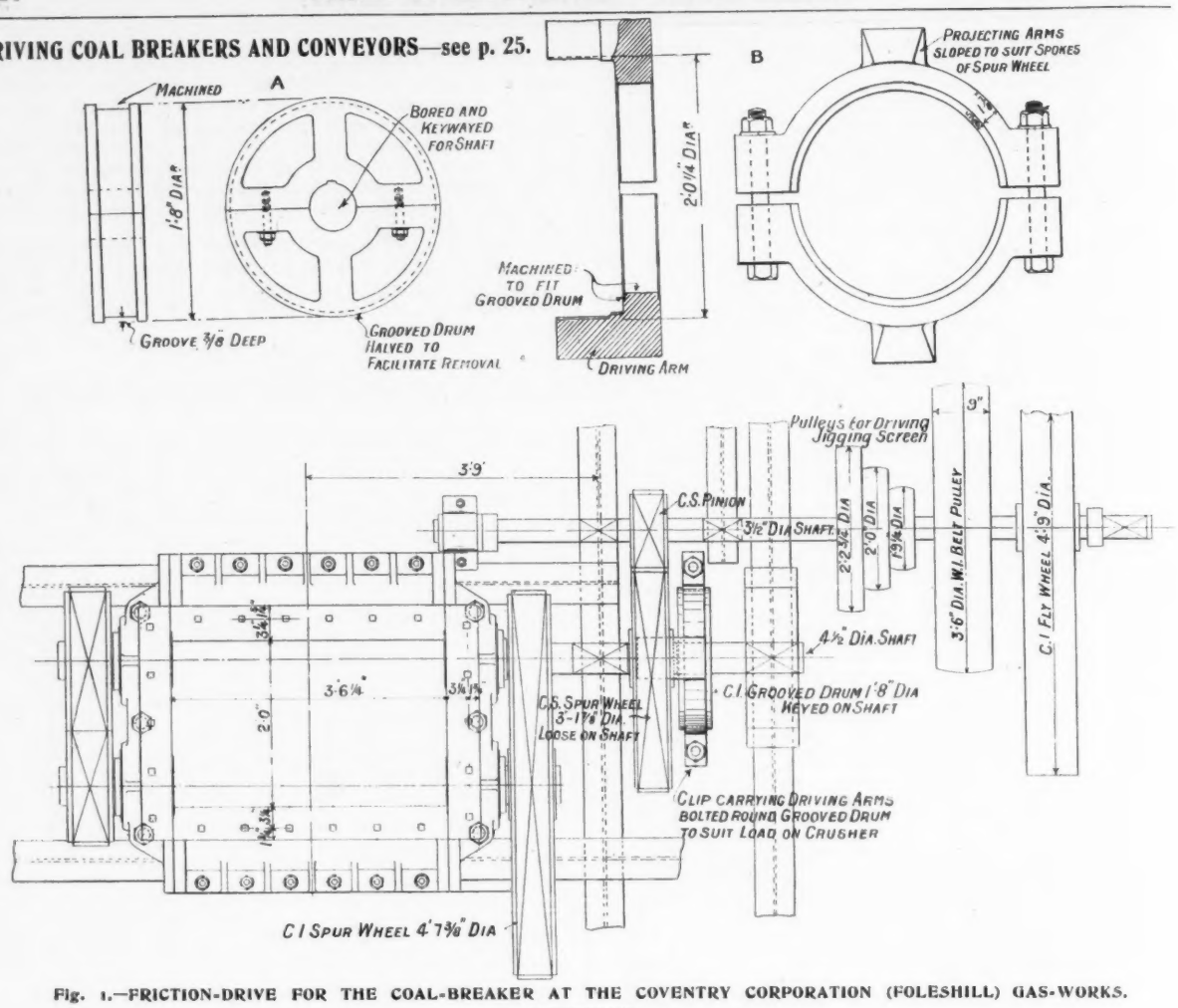


Fig. 1.—FRICTION-DRIVE FOR THE COAL-BREAKER AT THE COVENTRY CORPORATION (FOLESHILL) GAS-WORKS.

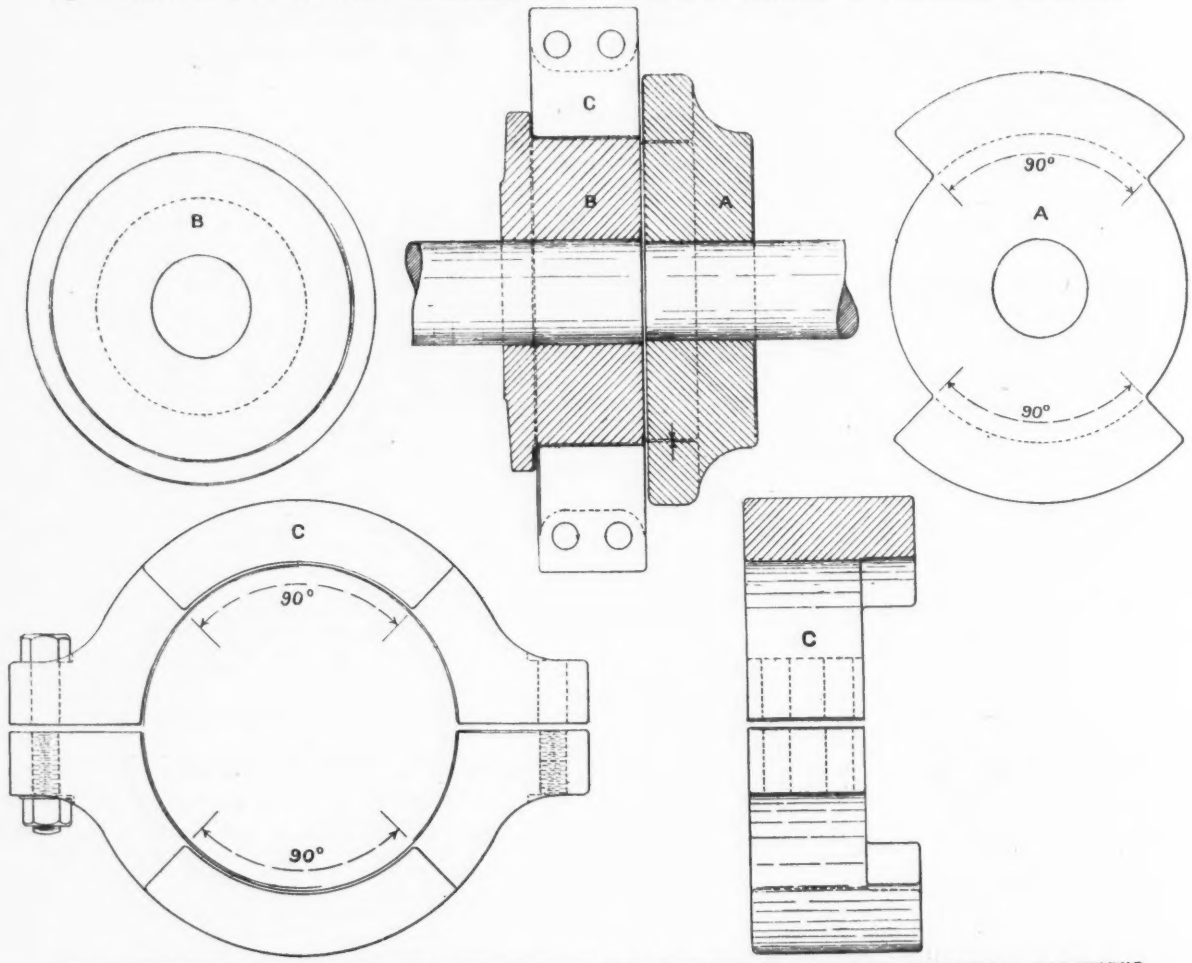


Fig. 2.—FRICTION-DRIVE FOR THE COAL CONVEYOR AT THE COVENTRY CORPORATION (FOLESHILL) GAS-WORKS.

DRIVING COAL BREAKERS AND CONVEYORS.

By Fletcher W. Stevenson, M.Inst.C.E., Engineer of the Coventry Corporation Gas-Works.

In your editorial of March 10 you comment on the methods of driving coal breakers—a point raised by Mr. Thomas G. Moffat's paper on "Plant Repairs and Maintenance"—and state that your preference is to have these belt-driven, as on a sudden inrush of coal or hard foreign matter, such as railway couplings, &c., getting into the breaker, the slip of the belt prevents damage to the breaker. In my opinion, whenever the engine is well up to its work, whether direct-coupled or strap-driven, damage is sure to occur if the breaker is suddenly pulled-up from causes stated by you.

We have a 60-ton per hour breaker, through which all the coal carbonized is passed—driven by a 50-H.P. steam-engine. The breaker is strap-driven; the speed being reduced by spur-and-pinion wheels.

When this was first put down, we had trouble owing to foreign material getting into the breaker and pulling it up sharply. Several times very serious fracture of the spur-and-pinion wheels occurred; and, as this plant is not in duplicate, on more than one occasion the works had to be shut-down until repairs were made.

Fortunately one of our mechanics saw at a colliery near our works a very efficient safety-clutch applied to a breaker, and he first designed an adaptation suitable for our coal-breaker, and has since designed another for the coal-conveyors.

It will be seen from the illustrations enclosed [reproduced on the opposite page] that the design is very simple. Fig. 1 shows the coal-breaker clutch; and fig. 2 the conveyor clutch.

The coal-breaker clutch (fig. 1) consists of two parts—viz., a grooved drum A keyed on the main shaft, and a split-clip B which fits round the drum and is tightened by means of bolts. Instead of being keyed-on, the large spur-wheel runs loose upon the main shaft, and is driven by the split-clip B, which is provided with projecting driving arms, as shown, to engage with the spokes of the spur-wheel. The split-clip is just sufficiently tightened-up to drive the breaker without slipping. If from any cause the breaker is suddenly pulled-up, the clip-clutch slips on the grooved drum, and allows the driving-shaft to continue revolving; while the shriek from the clutch will at once give warning of what has happened.

Twice within the last fortnight a pull-up of the breaker has occurred—each time due to large pieces of iron being in a truck hidden by the coal and discharged without being noticed. Perhaps a dozen times since the device was fitted has this occurred, but without damage in any case.

Fig. 2 shows a similar clutch in three parts applied to a coal-conveyor drive. The two parts A and B take the place of a pair of flanged couplings, and are keyed-on to the ends of the shafts. Instead of being bolted together, B is in the form of a grooved drum and carries a split-clip C. The latter has projecting driving arms engaging with recesses in A similar to a dog-clutch, and will slip on the drum if a sudden stoppage occurs or undue strain comes upon the driven shaft.

This safety-clutch is so easily applied, and at such a small cost, that I venture to think it may be of use to many of your readers.

HIGH-PRESSURE GAS SYSTEMS.

Regarding the list of towns (published in last week's issue) in which there are high-pressure gas systems (p. 890), the James Keith and Blackman Company, Limited, have sent the following as a supplement:

Additional Towns with a High-Pressure Service.

Aberdare	Lancaster	Stratford
Bromley (Kent)	Leamington	Tonbridge
Canterbury	Leicester	Uxbridge
Croydon	Margate	Walsall
Darlington	Marsden	Wandsworth
Enfield	Middlesbrough	Wellingborough
Epsom	Northampton	West Bromwich
Exeter	Portsmouth	West Hartlepool
Fleetwood	Ramsgate	Wood Green
Hereford	St. Albans	
King's Lynn	Sevenoaks	

Italian Gas and Water Association.—We learn from the Secretary and Treasurer of this Association (Sig. L. G. Maggioni, of Modena) that the forty-third congress will be held in Padua in September next, under the presidency of Sig. C. Pouchain, Consulting Engineer of the Anglo-Romano Gas Company. The precise date of the meeting has not yet been fixed; but it will be announced with the issue of the programme.

WORKS TOPICS—XXVII.

By "Modus Operandi."

Bonecourt Boilers for Gas-Works.

The question of surface combustion, which has recently formed the subject of a series of three lectures by Professor Bone at the Royal Society of Arts, is not one that is at all closely connected with the manufacturing side of a gas undertaking's business. There is, however, one direction in which the system is applicable, and well warrants a practical trial, and that is for steam-raising purposes. It must not be overlooked that a gas-works can profitably supply itself with gas at the cost into holder, which may be anything from a quarter to half the price at which it can be sold to the public. On the other hand, competing fuels, such as coke and breeze, must be valued at their market price to the outsider. Thus, although a Bonecourt boiler might be an extravagant luxury to the ordinary manufacturer when using town gas, it might well prove a desirable purchase to the gas maker. Especially would this be the case for boilers in use for intermittent periods, such as for sulphate plants, steaming holders, for portable boilers, and, in some works, for water-gas plants. In such cases a higher working cost is no great disadvantage compared with the convenience attending its use.

Comparative Costs.

For continuous work the relative economy of coke and gas as fuel for boilers would, of course, depend on the respective prices of the two fuels. Assuming that the coke, valued at 15s. per ton, has a calorific power of 12,000 B.Th.U. per lb., and is consumed in a boiler giving a thermal efficiency of 70 per cent., it will be seen that 1 lb. of coke will convert 8400 B.Th.U. into useful work. Assuming also that gas valued at 6d. per 1000 cubic feet (works cost) has a calorific power of 500 B.Th.U. net, and is consumed in a Bonecourt boiler giving a thermal efficiency of 93 per cent., it may be calculated that 1 cubic foot of gas will convert 465 B.Th.U. to useful work. On this basis it will take 18 cubic feet of gas to give the same result as 1 lb. of coke. Now 18 cubic feet of gas, at 6d. per 1000 cubic feet, equals 0·108d., and 1 lb. of coke, at 15s. per ton, equals 0·080d. Therefore on the fuel basis coke is cheaper than gas. But in the case of the solid fuel about one quarter should be added to the cost of the fuel to represent expenditure on stoking, cartage of ashes, cleaning of flues, &c., which would have no equivalent in the case of gaseous fuel. With this allowance, the cost is practically identical on the assumed figures. There would, however, be a considerable saving in initial outlay in the case of the Bonecourt boiler, and, incidentally, much advantage in some cases in respect of space occupied.

The claims of this type of boiler should not at any rate be overlooked; and it would doubtless be interesting to many readers of the "Journal" if Professor Bone were to supplement the information contained in his third lecture by stating the grounds on which a gas-fired boiler could profitably be installed in a gas-works.

Working of Tower Scrubbers.

The "Norwich" method of working tower scrubbers, which Mr. Thomas Glover has been kind enough to describe more fully in the "Journal" for March 31 (p. 892), in accordance with the writer's request, is undoubtedly an admirable arrangement. It forms a striking example of the scope so often afforded us—and so often neglected—for making the best of existing plant. The illustrations make very clear the whole of the detail; and study of the method described explains many of the reasons why tower scrubbers are so often found to be working in an inefficient manner. The quantity of liquor distributed per square foot of area, which Mr. Glover states should be 0·145 gallon per minute, is certainly not very substantial in amount—as a matter of fact, it is only one-half of that used in the writer's own works.

Very few of us, however, could claim to have in use scrubbers that are quite free from tarry matter and naphthalene, that are supplied by liquor strained through perforated plates, and that are used for gas from which all trace of tar fog has been previously removed. It is, therefore, probable that, with such ideal conditions, the liquor can, without loss of efficiency, be considerably reduced in amount. Under the conditions usually to be found in gas-works, these deficiencies may be, and probably are, to a great extent counteracted by a plentiful circulation of liquor. The example set by Mr. Glover is, however, one that can with advantage be followed by other gas engineers who have tower scrubbers in use.

Modern Horizontals.

The thoroughly practical paper read by Mr. Frank J. Pearce before the London and Southern Junior Gas Association is full of the details that works' men find so interesting. The new retort-house of the North Middlesex Gas Company is typical of modern practice in horizontal retort construction. The paper, though fairly complete in all those matters in which junior engineers are expected to be interested, omits much that would be especially instructive to those engineers who are even more concerned with the question of financial considerations. The actual cost of the various portions of the whole installation would be exceedingly useful to many, and, if placed side by side with the cost of a vertical retort plant of similar size, the information would be invaluable. The description shows plainly that the whole design is on the most modern lines, and Mr. Trewby and his Assistant,

Mr. Pearce, have every reason to be satisfied with the results contained in the paper.

One speaker in the discussion commented on the increase of 2300 cubic feet in the make per ton, comparing the old with the new retorts, and invited some suggestion as to the source of the additional gas. The explanation must surely lie in a number of different directions. Firstly, higher and more uniform heats, combined with a longer duration of carbonization, have undoubtedly lowered the volatile matter contained in the coke. This would represent additional gas; but it does not by any means account for so large an increase in the make per ton. To my mind, this is more likely to be due to the fairly even and low pressure maintained in the retorts under modern conditions. With old methods in use stopped pipes, and pipes in the preliminary process of being stopped, pitched hydraulic mains, even though to a slight extent only, were far too common, and were undoubtedly effective in maintaining a high average pressure in the retorts. Especially would this be so when the bulk of the gas was being driven off in the early stages of the charges. By this means much of the best gas would be lost at this period; while later, when less gas of lower quality was produced, the loss would be smaller in proportion.

Such conditions, even though not apparent without any close scrutiny and with the aid of U gauges on ascension pipes and hydraulic mains, completely explain, to my mind, a serious loss of gas. For there is no gainsaying the fact that a retort is a very porous vessel, and will allow large quantities of gas to escape into the setting, be the pressure ever so slight. The steady maintenance of a low pressure, varying from (say) level gauge to ⅛-inch, in all retorts would work wonders in the results of scores of retort-houses. It is such conditions as these which enable modern installations to show striking improvements on old-fashioned plant.

NAPHTHALENE IN COAL GAS.

By James Macleod, F.I.C., and James A. Russell, D.Sc.

In the "Journal" for Dec. 9 last (p. 813) a brief abstract appeared of a paper the above-named authors submitted to a meeting of the Scottish Section of the Society of Chemical Industry at their meeting on Nov. 25. The full text of the communication having since appeared in the "Journal" of the Society, we are able to supplement the few particulars already given.

The data contained in this paper were collected by the authors during last summer (1913) at the Greenock Gas-Works.

Stoppages owing to the deposition of naphthalene in the service pipes, induced the Greenock Corporation to introduce into their works a Livesey washer for the purpose of eliminating naphthalene from the gas. The washer was placed between the purifiers and the station-meter, so that by the time the gas reached the washer it was freed from its principal impurities [see "Journal of Gas Lighting," Vol. CXXIII., p. 682].

Two oils were experimented with for use in the above washer. Of these, one was a shale oil ('750 naphtha) and the other a coal-tar distillation product—"Special Solvent for Naphthalene."

It is to be pointed out that these costs are based on the complete extraction of the naphthalene from the gas, which is, of course, unnecessary, as all that is required is to lower the naphthalene content sufficiently to prevent its deposition in the mains and service pipes.

Freezing Experiments.

"Special Solvent for Naphthalene." When a test tube filled with this oil was immersed in melting ice, no naphthalene separated. When a sample of the oil saturated with naphthalene was treated in a similar way, naphthalene began to separate in a few minutes and in a short time the contents of the test tube became solid. From '750 naphtha saturated with naphthalene, large crystals of naphthalene separated after several hours' immersion in melting ice. Taking all things into consideration, it appears that the "Special Solvent for Naphthalene" is more suitable than the '750 naphtha.

The following points may be noted: The special oil is not so volatile and dissolves a larger quantity of naphthalene than the naphtha; and consequently when the special oil is used, the work of renewing the oil in the washer is not required so frequently as when naphtha is used. The special oil, being a distillation product of coal tar, has little or no effect on the quality and nature of the tar when run into the tar-well; whereas naphtha, being a paraffin product, alters the nature of the tar. There is not much difference in the relative costs of washing the gas.

	'750 Naphtha.	Special Oil.
Colour	Water Clear	Reddish
Sp. gr. at 15° C.	0·750.	1·000.
Distillation—Below 100° C.	17 per cent.	23·5 per cent. (1)
100°–170°	66 per cent.	4·5 per cent.
170°–185°	12 per cent.	63·5 per cent. (2)
Residue	3 per cent.	6·5 per cent.
Loss	2 per cent.	2 per cent.
Naphthalene dissolved by 100 c.c. of oil	11 grains	20 grains
Sp. gr. of saturated oil	0·780	1·009
Amount of naphthalene dissolved by 1500 gallons (3)	11,573,888	21,043,434
Cost of oil per gallon	9d.	18d.
" " 1500 gallons	13,500d.	27,000d.
Vol. of gas saturated with naphthalene at 20° C. which can be washed by 1500 gallons	70,145,000 c. ft.	127,536,000 c. ft.
Vol. of gas saturated at 15° (4)	106,153,000 c. ft.	193,059,000 c. ft.
Cost of washing gas per 1000 c. ft. when gas is saturated with naphthalene at 20° C.	0·154 (5)	0·188 (6)
Cost when gas is saturated at 15° C.	0·102 (5)	0·125 (6)

(1) Benzene, toluene. (2) Phenols. (3) Capacity of washer at works is 1500 gallons. (4) According to Schlumberger ["Journal," Vol. CXXI., p. 825] coal gas saturated with naphthalene at 20° C. and 15° C. contains 16·5 grains and 10·9 grains per 100 cubic feet respectively. (5) After allowing for oil run into tar-well and sold as tar at 2 22d. per gallon and allowing a loss of 20 per cent. (6) Allowing or a loss of 15 per cent. and oil sold as tar.

The method the authors used for estimating the amount of naphthalene in coal gas is as follows: The gas was passed at the rate of about 0·7 cubic foot per hour through a saturated solution of citric acid, and then through a ten-bulbed absorption tube containing 2·6 grammes of re-crystallized picric acid and about 100 c.c. of water, and finally through an experimental meter. The experiments were allowed to run overnight. The naphthalene picrate and picric acid in the absorption tube were washed into a 250 c.c. flask and heated to 40° C. on a water bath till all the picric acid had dissolved. After cooling, the naphthalene picrate was filtered off and the amount of unused picric acid determined by titration with $N/10$ sodium hydroxide in 50 c.c.

[The authors here gave references to earlier investigations on the subject under consideration—viz., Colman and Smith, "Journal," Vol. LXXV., p. 798; Dickenson Gair, "Journal," Vol. XCII., p. 749; Jorissen and Rutten, "Journal," Vol. CVIII., pp. 409, 676; and Schlumberger, "Journal," Vol. CXXI., p. 825.]

Amount of Naphthalene required to Saturate a Gas.

Temperature.	Grains per 100 Cubic Feet.	
°C.	I.	II.
0	6·0	2 0
5	9·8	3·2
10	14 1	6·7
15	19·0	10·9
20	24·6	16·5
25	30·9	24·7

I According to Allen ["Journal," Vol. LXXV., p. 673].
II. According to Schlumberger [*supra*].

If the figures given by Schlumberger are correct, then the coal gas entering the naphthalene washer must have been super-saturated with naphthalene on several occasions. If, on the other hand, the figures obtained by Allen are accurate, then the gas entering the washer has never been saturated.

On no occasion has the gas leaving the works been saturated with naphthalene. It was observed that on disconnecting the tube from the inlet of the naphthalene washer to the absorption apparatus, some crystals of naphthalene had formed. It appears probable that Allen's figures are not quite accurate.

The greatest amount of naphthalene found in the gas entering the washer was 24·7 grains per 100 cubic feet, on July 15-16, and the lowest amount 11·2 grains per 100 cubic feet, on Aug. 22-25. The figures obtained for the naphthalene at the inlet of the washer during July were greater than those for August. The averages for these months were respectively 19·7 and 15·2 grains per 100 cubic feet.

The amount of naphthalene in the gas depends upon many factors, and it is almost impossible to find any relations between the figures given in the tables. The amount of naphthalene depends first of all on the coal used in the retorts. Some coals, especially the coking coals, seem to yield a gas rich in naphthalene. As naphthalene is a pyrogenetic substance, the amount of it present in the gas will depend upon the temperature at which the coal is carbonized, and also upon the time during which the gas remains in contact with the hot coke and walls of the retorts. The amount of free space in the retort also has a marked influence on the amount of naphthalene formed.

The rate at which the gas is cooled in the condensers seems to affect the naphthalene content of the gas. It is to be noted that during July the average cooling of the gas during its passage through the condensers was 44·9° Fahr. and in August 55°; and during these months the amounts of naphthalene were 19·7 and 15·2 grains respectively. On July 7-8 the cooling amounted to 55°, and the amount of naphthalene fell to 13·9 grains per 100 cubic feet. From July 9 to 22 the cooling at the condensers was not so efficient, and there was an accompanying rise in the amount of naphthalene.

The dependence upon the rate of cooling is not general, as is

TESTS DURING JULY, 1913.

Date.	Naphthalene Grains per 100 Cubic Feet.		Make of Gas per Ton of Coal.	Temperature at Condensers.		Temperature of Atmosphere.	Vacuum at Exhauster.
	Inlet of Washer.	Laboratory.		Inlet.	Outlet.		
7- 8	13·9	4·3	9,819	122	67	59	12·5
10–11	24·7	5·6	10,923	97	61	59	8·3
11–14	18·1	5·4	11,102	101	63	63	10 0
14–15	22·9	11 9	10,709	93	62	63	10·0
15–16	24·7	5 7	10,527	103	65	66	9·6
22–23	14·4	6·1	10,480	123	67	63	12·0
23–24	18·3	9·1	10,555	122	69	65	13·0
24–25	21·2	5·5	9,805	117	65	64	10·1
Average . . .	19·7	6·7	10,498	109·7	64·8	62·7	10·7

NOTE.—20 gallons of special oil were added to the naphthalene washer on the 9th, 15th, 18th, 24th, and 28th of July.

TESTS DURING AUGUST, 1913.

Date.	Naphthalene Grains per 100 Cubic Feet.		Make of Gas per Ton of Coal.	Temperature at Condensers.		Temperature of Atmosphere.	Vacuum at Exhauster.
	Inlet of Washer.	Laboratory.		Inlet.	Outlet.		
1- 4	16 6	4·9	9,838	123	66	65	12·6
13–15	15·4	5·6	10,164	125	65	62	14·0
15–18	18·5	5·5	10,133	123	65	64	14·0
18–19	18·4	10·4	10,446	109	65	63	16 0
19–20	15·5	7·3	10,490	124	65	60	17·0
20–21	14·1	8·0	10,420	128	66	64	16·5
21–22	..	10·4	10,696	119	63	63	16·5
22–25	11·2	4·6	10,483	113	63	59	15·7
25–26	11·8	4·5	10,657	106	61	62	10 0
26–27	..	6·3	10,194	123	65	64	10·2
Average . . .	15·2	6·7	10,352	119	64	62	14·2

NOTE.—30 gallons of oil were added to washer on 1st and 9th of August; 50 gallons on the 13th; 40 gallons on the 18th; and 20 gallons of oil and some naphtha on the morning of the 22nd.

AVERAGE RESULTS OF TESTS.

Date.	Naphthalene Grains per 100 Cubic Feet.		Make of Gas per Ton of Coal.	Temperature at Condensers.		Temperature of Atmosphere.	Vacuum at Exhauster.
	Inlet of Washer.	Laboratory.		Inlet.	Outlet.		
July	19·7	6·7	10,498	109	64	62	10·7
August . . .	15·2	6 7	10,352	119	64	62	14·2
Average . . .	17·45	6·7	10,425	114	64	62	12 4

seen in the figures. However, the figures obtained seem to indicate that it would be well to let the gases enter the condensers as hot as possible and cool them there as effectively as possible.

An attempt has been made to correlate the amount of naphthalene in the gas with the vacuum at the exhauster. By keeping the exhaust low it was thought that perhaps less naphthalene would evaporate into the gas. On the other hand, a strong exhaust would draw the gases away from the retort more rapidly, and so lessen the time during which the gas is in contact with the hot coke and the walls of the retorts.

One of the coals in use was considered to be the cause of some of the naphthalene trouble. Experiments with this coal were carried out in the coal-testing plant, with the following results. The charge consisted of 2 lbs. of coal, and the time of heating was one hour.

		840° C.	960° C.	1040° C.
Temperature of retort				
Volume of gas per ton	cubic feet	8133	9327	11,083
Weight of coke per ton	cwt.	12·5	12·25	12·25

In none of the above cases was there any indication of naphthalene on passing the gas through a solution containing picric acid in suspension. In these experiments the gas was not long in contact with the hot coke, and the cooling was very efficient. Lime was used in the purifier box. No tar was present in the gas on its arrival at the holder. This is striking evidence of the elusive character of naphthalene, as naphthalene was generally troublesome when this coal was in use in the works.

The figures given in the tables indicate that there is some relation between the amount of naphthalene in the gas leaving the works and the daily temperature, provided account is taken of the efficiency of the washer for any particular day.

Oil has to be added to the washer every few days. The results of the experiments show that the day after the oil has been added to the washer there is a decrease in the amount of naphthalene per 100 cubic feet. Thus, on July 14–15 the amount of naphthalene leaving the works was 11·9 grains per 100 cubic feet; on the 15th oil was added to the washer, and on the 15th–16th the amount of naphthalene fell to 5·7 grains. Similar results are to be observed on July 24 and 25.

During the period of the tests in August the amount of gas passed through the washer was 23,172,000 cubic feet. The amount of oil added in the same period was 170 gallons. The average weight of naphthalene extracted by the oil was 8·5 grains per 100 cubic feet. This gives a total quantity of napthalene extracted of 1,969,620 grains, or 11,586 grains per gallon of oil used. Experiments showed that the oil was capable of dissolving 14,000 grains per gallon. This extraction works out at an efficiency of 82·7 per cent.

It was intended to carry out experiments on the effect of back-pressure or varying seal in the washer on the efficiency of the extraction; but this could not be undertaken, although it is hoped to carry out tests at a future date. The naphthalene content of the gas has, as usual with the advent of colder weather, fallen to a very low figure; and in any case tests would not have been exactly comparable with those made previously.

A Glasgow Gas Exhibition Next Autumn.

From a glance at the prospectus, it is manifest that the Corporation of Glasgow are aiming at the promotion of a first-class gas exhibition in the Exhibition Hall, New City Road, next autumn. Industrial engineering and machinery will be incorporated; and every assistance will be given to exhibitors who desire to show machinery in motion—an unfailing attraction to the public. The exhibition will remain open from Sept. 23 until Oct. 17; and during its run the annual conference of the British Commercial Gas Association will be held in Glasgow. The latest developments in the use of gas will be shown by the aid of the cinematograph; and there will be lectures and demonstrations of a suitable character. Gas required by exhibitors on their stands will be supplied, up to a reasonable amount, by the Corporation free of charge. A point to be noted is that, in order to ensure uniformity of design and save expense to exhibitors, the Corporation will erect all the stands; and the price charged for floor space will include the cost of same. Full particulars upon this and all other matters can be obtained from the Exhibition Manager, Mr. James M. Freer, of No. 38, Bath Street, Glasgow, and Nos. 30-32, Ludgate Hill, London.

The Illuminating Engineering Society meet to-night (Tuesday) for a discussion, on "The Lighting of Railway Carriages and Other Public Vehicles," which will be opened by Mr. E. Kilburn Scott.

A meeting of the London and Southern District Junior Gas Association will take place at the Westminster Technical Institute, S.W., on Friday the 24th inst., when Mr. George Keith will read a paper entitled "High-Pressure Gas Lighting, and a Description of the New Silica Gas-Lamp." The paper will be illustrated by lantern slides; and there will be a demonstration of the lamp, and some models on exhibition.

INFORMAL MEETING OF SCOTTISH GAS MANAGERS.

The Proceedings last Wednesday in Glasgow.

THE Thirty-First Annual Meeting of Scottish Gas Managers was held in the Grand Hotel, Glasgow, last Wednesday—the PRESIDENT (Mr. William Wilson, of Falkirk) in the chair.

The CONVENER (Mr. J. W. Napier, of Alloa), at the opening of the proceedings, said he was glad to see so large an attendance. At no time in the history of the industry had the affairs of their particular business appeared to be so prosperous, or had the future held out such high hopes. There was one feature of their business that they must recognize. Time was when, as technical men, they confined themselves pretty much to gas-works affairs. But they would agree with him that to them, as technical men, the time had now arrived when they must recognize the labours and good services of manufacturers of gas-works requirements—both of constructional plant and of gas appliances. Evidence of the fact was found in the existence of the Society of British Gas Industries and the British Commercial Gas Association. He suggested, therefore, that in their proceedings that day they should not confine themselves to mere technical matters, but rather take a wider outlook of the affairs of their industry, and recognize the labours of those who were co-partners with them in the success of the gas industry. He concluded by intimating the receipt of apologies for absence from a number of those who usually attended the so-called "Informal Meeting."

ADDRESS BY THE PRESIDENT.

The nature of our business consisting of so many processes, practically precludes anyone from giving an address on any one subject unless he is a specialist. I therefore require to make no excuse for my remarks to-day, which I trust will form the groundwork for a good discussion. At the same time I would remind you that the main function of this meeting is to discuss matters of importance in connection with our industry; and I hope that any manager present who has a subject he considers of interest to us will not be backward in putting the matter before us when the time comes.

A REVIEW.

The year which has passed since we last met has been, in many respects, an arduous one, and the conditions obtaining have been very adverse to the successful commercial working of our undertakings; for we all have suffered from the extraordinary advance in coal prices, with increased railway rates, and, in a large proportion of our undertakings, increased wages. Then the return from the residuals was not so good as in the preceding year; for there has been a considerable reduction in the price of sulphate of ammonia. During the past few months, too, there has been an alarming and regrettable falling off in the price of coke, producing a condition almost approaching panic in the coke market. It is at times like these, when stocks of coke are accumulating all over the country, that the work of the Commercial Sections becomes most necessary, and at the same time most difficult. Our confrères in the South and the British Commercial Gas Association are doing excellent work in advertising the good qualities of coke as a fuel; but the effect of their work is not felt here in the North. Serious cutting of prices may give temporary relief from the congested condition of coke yards in a few small gas-works, but the larger works cannot hope to secure any benefit by such a proceeding, and therefore we must face the inevitable and utilize our storage to the utmost. There are again signs of unrest in the coal mining industry, which makes it doubtful whether any reduction of prices may be expected this season. Should matters come to a crisis in the coal industry, our stocks of coke, large as they are, will be required. Before passing from this subject, I would express the opinion that the industries of the country have suffered long enough from the unsettled relations existing between coal masters and miners; and I think that the Government might quite well devote some time to the consideration of the settling, once for all, of this question, either by nationalizing the mines or some other method.

DISPOSAL OF COKE.

The question of disposing of our coke for household consumption locally is not such an easy matter in certain localities as one would think at the first glance, for where a works is situated in an industrial locality, and there is at ordinary times a good demand for coke in bulk for industrial purposes, the industrial demand will secure first consideration. When dull times come, and it is desired to cultivate a household trade, the householder has to be educated to the advantages of coke as a fuel. The percentage of ash in the majority of the coals available in Scotland is considerably higher than in England, which is a deterring factor in pushing the household trade. At times like the present, one is almost inclined to be selfish, and express the wish for some form of legislation to abolish the smoke nuisance and prohibit the use of bituminous coals for household consumption—as is done, I believe, in the City of New York. Were such legislation taking place, could we supply the demand for coke? I believe we could by altering our methods of retort-heating to the method in vogue at coke-ovens, which is to utilize, say, 50 per cent. of the gas produced for heating retorts and selling all the char produced. I am pleased to say that there are a few gas-works in Scotland which are approaching the goal aimed at by Mr. Newbigging the other day. In fact, I rather think some are through the goal. These works, I feel sure, could have profitably adopted such a method of heating as I have mentioned for at least the six summer months for a number of years past. Another difficulty which arises where the gas undertaking is owned by a corporation, is that the corporation cannot very well push the sale of char for household consumption in opposition to the local coal merchants, who are ratepayers. To those who are inclined to take a pessimistic view of the outlook in the coke market at present, I would say: "We've aye been provided for and sae will we yet."

TAR.

Tar prices have been fairly steady, but I am sure we do not receive the prices we ought, in view of the demand for road-making. Those works having their own tar-distillery plants, are certainly in the best position to get the most return from this bye-product.

VERTICAL RETORTS.

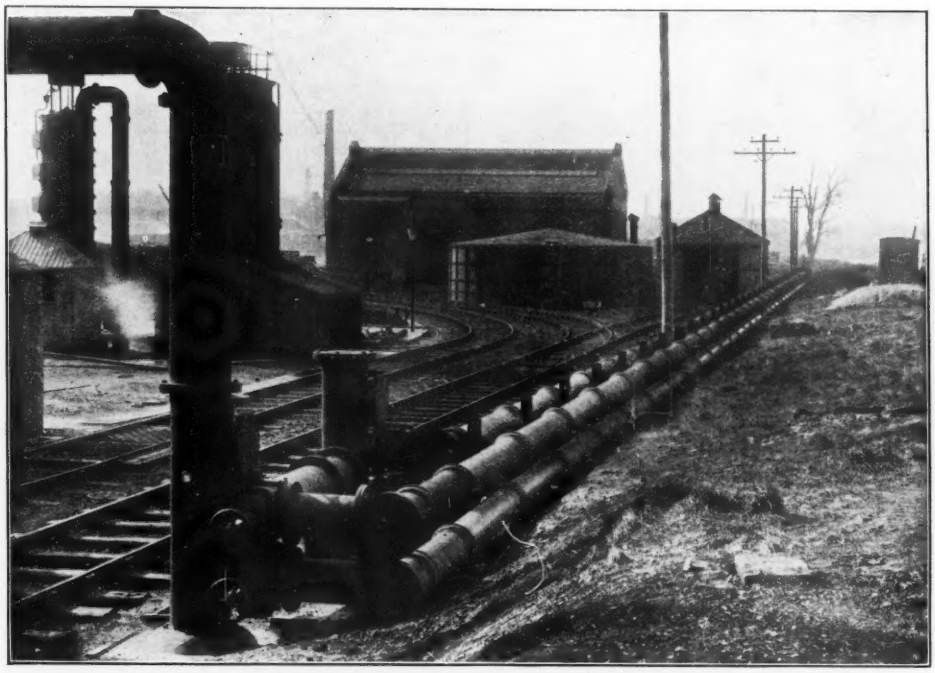
During the year which has passed, the ever-increasing popularity of vertical retorts has been most apparent, and a considerable number of gas-works in Scotland are now equipped, or being equipped, with the latest designs of this class of carbonizing plant. In my own case, I regret to say that for several reasons I am unable to recommend my Council to adopt verticals at present, as our horizontal carbonizing plant is not old enough as yet to warrant us in scrapping it. We have, besides, a considerable surplus of spare retorts (about 30 per cent.) in the winter time, so that there is no necessity for increasing our producing plant. The day will come (soon I hope) when we will be in a position to change our system; but it is possible that when an extension is required, chamber ovens may be found to be more profitable to us than verticals, as some 25,000 tons, or thereby, of metallurgical coke is used in our burgh annually, and the average price paid is never less than 100 per cent. more than we obtain for our coke. The present prices range from 22s. to 28s.; while we are getting an average of 11s. There is a word of warning I would like to say to those members who are still working with horizontal retorts and machinery; and it is in connection with the tendency to lengthen the weight and duration of the charges. I would warn such that before adopting these later methods, the size of the producer ought to be very carefully considered, as by lengthening the duration of the charge the furnace has to be run for a greater period between feeding times, and with a small furnace this might have disastrous results.

CONDENSATION.

I mentioned last year a rather remarkable experience I had had with condensers, when our water-cooled condensers were damaged by an explosion and temporary pipes erected, simultaneous with which an entire cessation of naphthalene troubles took place in the district. Following on this experience, during last summer I laid down a permanent horizontal atmospheric pipe-condenser. Our works are large, and a site was selected alongside one of our boundaries where the condenser would not be in the way of anything. The condenser consists of four rows of 12-inch cast-iron pipes. The length over all is 100 yards, giving 400 yards of 12-inch pipe in all. About one-half of the pipes we had in stock in 9 feet lengths, with turned-and-bored joints. New pipes were got exactly similar to these. The pipes are supported by a vertical steel channel, 6 in. by 3 in., having 3 in. by 3 in. by $\frac{3}{8}$ in. angle cross trees, the channel rising between the rows of pipes. Two pipes were below and two above; the end of the channel being embedded in concrete. One such support is placed about 6 inches behind the faucet of each pipe length. The pipes are placed at 2 feet apart between centres, horizontally, and 1 ft. 9 in. apart, vertically. The pipes have a fall of 2 feet in the 100 yards, half of the pipes falling back to the inlet, and half to the outlet. The cost of the condenser is as under:—

Cost of Pipe Condenser.

	£	s.	d.
Cast-iron pipe	290	17	6
Specials	108	12	6
Steel pipe	10	10	0
Holmes valves	33	15	0
Lead	5	10	0
Concrete foundations	22	10	0
Wages	65	14	0
Steel standards	16	0	0
	£553	9	0
Less value of old pipe	130	0	0
	£423	9	0



THE HORIZONTAL ATMOSPHERIC PIPE-CONDENSER AT THE FALKIRK GAS-WORKS.

This was covered by the sum obtained from the Insurance Company, who paid our claim in full for the damage to the water-tube condensers. I should mention in passing that we were fortunate in being insured; and I consider that a fire insurance premium is money very well spent. In taking out the cost for cast-iron pipes, I valued the old pipes at the same rate as the new. I have shown the actual net cost on deducting the value of the old pipes. The maximum quantity of gas passed per 24 hours last winter was one million cubic feet, and the temperature at the outlet since Nov. 1, 1913, has not exceeded 50° Fahr. The maximum and minimum temperatures at the inlet and the outlet during the same period are as under:

	Inlet.		Outlet.
Maximum	130	..	50
Minimum	96	..	32
Average of daily readings . . .	110	..	44

The difference in vacuum between the inlet and outlet when passing 1,000,000 cubic feet per day was $\frac{7}{10}$ inch. One advantage over the water-cooled condenser is that there is now no running charge for gravitation water or pumping, besides, if we ever decided to enlarge or replace this condenser, the 12-inch pipes would be as good as new for street work. One noticeable effect on the quality of the gas since the introduction of the atmospheric condenser has been a greater regularity and constancy in the candle power.

A year ago I attributed the cessation of naphthalene trouble to the change-over from water cooling to atmospheric cooling. We had, however, a recurrence of naphthalene troubles in the autumn of last year, though not to the same extent as in former years. These troubles continued until last month, notwithstanding the fact that the naphthalene contained in the gas leaving the holders was kept below 4 grains per 100 cubic feet by washing. An examination of all the circumstances has caused me to alter my opinion. During the period of cessation of naphthalene troubles, our plant was arranged as follows: Temporary pipe condenser; exhausters; naphthalene washer; Livesey washer; ammonia scrubber. The naphthalene washer, which is of the revolving brush type, was placed in the above position to prevent naphthalene stoppages in the ammonia scrubber; besides there was no room to connect it between the Livesey washer and the ammonia scrubber, and an examination of the gas then showed a very small quantity of tar at the inlet to the Livesey washer. After erecting the temporary pipe-condenser, which only reduced the temperature of the gas to between 84° and 64° Fahr., the naphthalene washer was found to fill up with tar. The naphthalene washer was, therefore, run as far as possible empty; the collecting tar being run off twice a day. The temperature of the gas was reduced in the Livesey washer to 60°, liquor being circulated through the Livesey washer from the tar-well, and an extra supply of gravitation water was run through the ammonia scrubber, the Twaddel of the liquor in the tar well being kept at 1½°. [This, of course, threw extra duty on the ammonia still; but I considered it advisable under the circumstances.]

It is unfortunate that no systematic tests for naphthalene were taken of the gas during this period; but, owing to the entire absence of stoppages in the district, it was not considered necessary. It is possible that the quantity of thin tar in the revolving naphthalene scrubber denuded the gas of the naphthalene. Shortly before the accident to our water-cooled condensers, I had placed a film of shale naphtha, ·765 sp. gr., on the surface of the water in our gasholders, and also in our station meter. This was by way of experimenting on the lines of some of our American confrères, who hold forth the opinion that such a film of oil prevents the gas from absorbing moisture from the tank water, keeping the gas dry, and that so long as the gas can be kept dry no naphthalene troubles need be feared. Just before the naphthalene troubles recurred last summer, we had altered our plant, placing the Livesey washer in front of the naphthalene washer, and erecting a new ammonia scrubber in its place. I am of opinion now that the film of oil in the gasholders which had been overlooked in the exciting period following on our explosion, and subsequent alterations to plant, had probably served a double purpose, for it would not only prevent the gas from absorbing moisture at times when conditions of atmospheric temperature and pressure would predispose it to do so, but it would probably be slowly absorbed by the gas and act as a carrier for the naphthalene.

In order to clear up the matter, I have since February been working again with a film of oil on the water in our station meter, and in one of our gasholders, and again there has been a marked falling off in the number of complaints of napththalene stoppages. I opened the other holder to see the condition of matters inside, and ascertain whether any of the oil which was put in about November, 1912, was still apparent on the surface of the water. There was no trace whatever of the oil, showing that it had been absorbed by the gas, and pointing to the likelihood of it having acted as a carrier for the naphthalene during the period of cessation of troubles. Incidentally, there was not the faintest trace of naphthalene on the framing or sheets of the gasholder. The question now arises with me, how much of this oil will be required, and will it not be more easy to apply it through a carburetter? The gasholder method of application would certainly save the cost of a carburetter, and the heating of it, in a works where there is no carburetter. Besides it is possible that the gas will, by this method, take up only such a quantity of oil as it may require.

AMMONIA RECOVERY.

A good deal has been said during the past year regarding ammonia losses; and I may say that this subject has given me much concern in my present position. Our new works were erected in 1904-05, and were officially opened during 1906. Our scrubbing plant is considerably greater than that obtainable at the old gas-works, for the brush scrubber was enlarged by 50 per cent. when removing it, and at the same time there was placed immediately in front of it a new Livesey washer.

Shortly after my appointment in 1907, I looked into the question of the amount of tar and liquor being sold per ton of coal carbonized, and, on comparing this with the quantity I had been selling in my previous position, and with the average quantity manufactured at the old works, as shown by the records, I found an alarming difference. I considered that a production of 50 to 52 gallons of mixed tar and liquor, the liquor of 4° Twaddel, was satisfactory working; but I was disappointed to find that we were only selling 44 gallons. I examined the gas for ammonia at the outlet of the brush scrubber, and speeded-up same, besides increasing the volume of clean water being run through it. At the same time, I tested the liquor itself, and found that in a distillation test the quantity of ammonia was about right. I therefore concluded that, for some reason or other, our liquor now contained a larger proportion of free ammonia than formerly. It is well

known, of course, that the more free ammonia a liquor contains, the lighter its density becomes. Therefore the degrees Twaddel were not a true index of the quantity of ammonia, I subsequently insisted on selling the liquor to our tar distillers on a distillation test basis, instead of by the Twaddel hydrometer as formerly. "The strength of liquor is to be 8 oz. at 60° Fahr.—*i.e.*, one gallon at 60° Fahr. will yield, on distillation, sufficient ammonia to exactly neutralize 8 oz. of pure strong concentrated sulphuric acid." We had considerable trouble at first when inaugurating the new system through our tests not agreeing. Our method of sampling had been to draw a sample from the liquor in our tar-well immediately before filling up the distillers' barge (the tar in our case being conveyed to the distillery by canal barge carrying 20,000 gallons), while the tar distillers drew a sample from the liquor in the barge after it had reached their works. After testing our reagents with those of the tar distillers, we found them to agree most accurately. Therefore the difference in our results had to be looked for in the liquor sample; and we found that the liquor in our tar-well lay in strata, the lighter stratum from which our samples were taken, containing most ammonia, being on the top. We eventually decided on a method of sampling which we found very satisfactory. It consists of filling two sample quart bottles from the liquor immediately after it had been pumped into the barge, the pumping having mixed it thoroughly. I found by this distillation basis of sale our production per ton of coal of mixed tar and liquor increased to 48 gallons per ton.

In 1911, our sulphate of ammonia plant was installed; and when erecting this plant I took the opportunity of re-erecting a large cast-iron circular tank, which I had brought from the old gas-works. This tank measures 32 feet in diameter by 11 feet deep. It was roofed-in with timber having radial pitch-pine joists, supported in the centre from a cast-iron column, giving the roof 3 feet of a fall from the centre to the sides. The roof was clad with 1½ inch flooring, covered with a 1 inch thickness of limmer rock asphalt, laid on in two coats; the asphalt being worked close against the top flange of the cast-iron side plates, so as to keep the roof as air-tight as possible. Our method of working when starting-up the ammonia plant was to collect liquor until this circular tank was filled, when we started the sulphate of ammonia plant, and worked it night and day in two shifts until the liquor in stock was used up.

I was surprised to find that our yield of sulphate of ammonia per ton of coal only reached 23 lbs. Tests of the liquor effluent from the still showed that the still was doing its work perfectly. Tests of the gas at the outlet of the ammonia scrubber were also satisfactory, except for a brief period during mid-winter, when I discovered that the brushes in one of the scrubber compartments had ceased to revolve. The possible loss of ammonia, through evaporation, quite appealed to me; and I placed a film of ordinary paraffin oil on the surface of the liquor in our liquor storage tank, and worked our sulphate of ammonia plant by day-shift only, with a view to working-up the liquor continuously. Since then our yield of sulphate, I am glad to say, has increased, and now stands at 26 lbs. of sulphate of ammonia per ton. I am not, however, satisfied with this, and my next move will be to alter the liquor overflows from the scrubbers, in order to do away with the seal pots, through which I am convinced a very considerable quantity of ammonia is lost annually. I am also arranging to carry all liquor pipes to the bottom of the tar-well, in order to prevent agitation of the liquor in stock by the fresh liquor falling in, as it does at present. I know of a works in London where the yield of sulphate was increased from 24 lbs. to 28 lbs. by altering the position of the inlet of the liquor to the tar-well.

With regard to the seal-pots at the scrubbers, although these are almost invariably covered with wooden lids, still a wooden lid is not tight, and ammoniacal liquor of considerable strength passing from the inside of the scrubber, where it leaves an ammonia saturated atmosphere and a pressure of probably half a pound per square inch, and passes into an open seal-pot, where there is atmospheric pressure only and an atmosphere devoid of ammonia, the natural tendency is for the liquor to immediately give off ammonia. My intention is to fix some new liquor outlet pipes to the ammonia scrubbers, of 1 inch bore (a ½-inch pipe is quite sufficient to deal with the liquor effluents from the scrubbers). The new 1-inch pipe will have enclosed seals, and be run to the bottom of the tar-well. The existing 3-inch and 4-inch liquor outlet pipes and seal-pots will be left, and will come into action only in the event of the small pipe not being sufficient at any time to take away all the liquor. This will entirely prevent any losses from the seal-pots. Losses of ammonia from tar-wells and seal-pots are unseen and continuous, and the loss is, in many cases, only apparent in the balance-sheet at the end of the financial year. Even there it is often passed over and accepted as unavoidable, or attributable to the local conditions, and no attempt made to remedy matters.

In connection with ammonia recovery, I am of opinion that a gas-works cannot be too well equipped with scrubbing plant, as, given plenty of scrubbing plant, it is possible to knock-off a scrubber for repairs, or for cleaning in the summer time, without incurring any ammonia losses. I know of a works in the vicinity where it was found to be a profitable investment to duplicate a scrubber rather than run without a scrubber at all for three or four weeks—the time required to fit the then existing scrubber with a new centre shaft.

We find some surprising results when we inquire what our neighbours are doing in the way of ammonia recovery. One works in the Glasgow district constantly makes 32 lbs. of sulphate of ammonia per ton of coal without any addition of lime to the still. The secret of this excellent production, in my opinion, is explained when we find that they have a very large surplus of scrubbing power and work with very weak liquor. Then in the old gas-works at Kirkintilloch, I had no difficulty in making 50 to 52 gallons of mixed tar and liquor (liquor of 4° Twaddel), with limited scrubbers and a very small tar-well; but the smallness of the tar-well there was, I think, the explanation, for it forced us to despatch tar and liquor almost daily. One small works in my neighbourhood sells over 60 gallons of mixed tar and liquor per ton. Their tar-well is so small that each day's production has to be pumped into casks at once. All this anxiety to prevent losses of NH_3 is a plea for some reliable and convenient form of direct continuous recovery process; but as we cannot all adopt such a process right off, we must make the best of the plant we have.

PURIFICATION.

I have only one word to say with regard to purification. That is to express my thanks to Mr. Hislop for his remarks, at this meeting four years ago, on the downward passage of gas through purifiers. Last summer I took the opportunity of transferring the outlets and inlets of my purifiers. The results have been delightful, as we have not had to change a purifier for back-pressure since the alteration. For the two years previous to the alteration, I worked with oxide, and the backward rotation method of hanging boxes, admitting 1½ per cent. of air. I soon had trouble with stiff boxes, and in every case found that the stiffness occurred at the bottom layer—only about 4 inches of the oxide being affected, while we had at least a depth of 3 feet of oxide in two layers in the boxes. All this material (in our case about 50 tons per box) had therefore to be removed from the boxes in order to get at the stiff portion, entailing a needless amount of labour and expense. This showed, however, the interesting fact that with four boxes 30 feet square, and the backward rotation method of changing, with the admission of 1½ per cent. of air, a layer of 4 inches of oxide in each box was sufficient to do all the purifying in our case. Since the introduction of Mr. Hislop's method, the back-pressure shown by any one box has never exceeded one inch.

Another matter in connection with purification was brought under my notice when examining the inside of the gasholder recently. I was alarmed and surprised to find the inner side of the sheets very badly rusted. This rusty condition has only arisen since we adopted oxide purification about three years ago. It is a condition, of course, which, if allowed to go on, would mean ruination to our plant, and may possibly cause us to revert to lime purification. Probably some gentleman present can throw some light on the subject. Personally, I have not had time to investigate the matter beyond testing the tank water for alkalinity or acidity. It was quite neutral.

DISTRIBUTION.

An important point in connection with the present conditions obtaining in the distribution side of our departments is the ever-increasing demand for higher pressures in our mains. It is a condition of affairs which makes it much more difficult and dangerous for the main and service layer to carry out his work with safety. It behoves us, therefore, to see that he is supplied with the best and safest tools and appliances.

GUARANTEE RATE.

There is just one other point I should like to mention before concluding; and it arises out of the number of arbitration cases we have had recently, where gas companies undertakings were transferred to corporations. I would like to say in connection therewith, that it is a pity that the corporations are not endowed with a little more power so far as the application of the gas contingent guarantee rate is concerned. Very few of the undertakings recently transferred are able, by reason of excessive capital charges, to sell gas at a reasonable figure. I do think that in the case of a transfer, the corporation should be empowered to levy this gas contingent guarantee rate for a period of (say) five years, in order to reduce the capital burden of their undertaking, and enable them to sell gas at (say) 2s. 6d. per 1000 cubic feet. In Falkirk, the question of the guarantee rate has been brought before us quite recently, for the Corporation have tried unsuccessfully in two successive years (1911 and 1912) to extend the burgh boundaries, and take in the Larbert district, to which district about one-third of our gas output goes. This district, though at a very much greater distance from the gas-works than any part of the burgh, has been obtaining gas at the same rates as the burgh, ever since the Town Council purchased the undertaking from the Falkirk Joint-Stock Gas Company in 1895. Prior to the purchase, I may say the Gas Company charged 4d. per 1000 cubic feet extra for gas supplied in this district; but so soon as the question of compulsory purchase arose, the Company put this district on even terms with the burgh. This, of course, induced the consumers in the district to threaten to oppose the purchase of the undertaking by the Town Council, unless they were supplied with gas at the same rate as within the burgh. This, I may say, was agreed to. My Council all along have considered that it was hardly fair for the ratepayers in this large district outside the burgh to obtain gas at the same rates as their own ratepayers, and yet have no responsibility for the capital involved in the undertaking. The power to levy the guarantee rate is desirable also from another point of view, as where the gas undertaking has been enlarged

in the past, in order to supply large public works, and such works have subsequently taken in electricity, or commenced to produce it themselves, it would still be possible to levy a sufficient rate on these works as would counterbalance the capital charges applicable to the plant thrown idle by their hiving off. It would also, I feel sure, help us to retain a considerable amount of business; for our large consumers would think twice before taking on electricity. This would probably mean that the electric department could only be run at a loss, which in the case of a corporation owning both supplies would be borne by the gas-rates. It would have the effect of retarding the reckless expenditure of capital on these undertakings.

THE SALES SIDE OF THE INDUSTRY.

In conclusion, I would say that I have only touched on a few points in connection with our industry, and those more particularly relating to the manufacturing side. I hope that the sale side will not be overlooked in the forthcoming discussion. I have been thinking for some time that it might be a good idea to contract with consumers to supply their premises with light and heat for all purposes for a fixed sum per annum. It would be necessary, however, to have a safeguarding meter, as in water supplies, on which the consumer could be charged if a predetermined consumption was taken. We all "plough a lonely furrow" from year to year, with very few fair days such as this on which we can tell one another of the acres ploughed, the boulders on which we struck, and even mention the annoying though harmless "craws" that followed us. Were it not for our energetic journals we would be lonely indeed. Still there are a few of us who are prevented from having the benefit of the journals; and to these the only break in the monotonous round is our meeting to-day. In these days of keen competition, we need all the brotherly support we can get, and what greater encouragement can we have than to hear the voice of another ploughman—probably our senior in the next field—equipped with the latest implements, relating what he finds there.

DISCUSSION.

The Convener (Mr. Napier, of Alloa) opened the discussion. He considered the address eminently practical. Mr. Wilson had taken in review not only the commercial aspect of their business, but had also considered the details. When they were reminded that a coating of paraffin oil on their liquor tanks was sufficient to increase the sulphate of ammonia, they recognized that it was by taking care of the little things that they increased their efficiency and augmented their profits. He was not sure that they would agree with Mr. Wilson's view of what ought to be considered a satisfactory yield of sulphate of ammonia per ton of coal. Mr. Wilson suggested that the large yield of sulphate per ton in certain works was due to satisfactory washing and scrubbing. Having regard to the test for loss of ammonia being so simple, either during the process for the absorption of ammonia or at the waste-liquor effluent at the sulphate plant, he (Mr. Napier) considered this was not the proper direction. He was inclined to believe that the lower yield of ammonia was due to two causes—the kind of coal used, and the high temperatures that prevailed in the more recent methods of carbonization. It was undoubtedly the case that as the powers of carbonization had been increased the tendency had been to destroy the ammonia. He possessed evidence of this fact, as found in the increased yield of ammonia and tar which they knew was possible with vertical retorts. There one had conditions of carbonization with the absence of radiant heat that conserved ammonia once it had been formed, and there was no possibility of it being destroyed. The author sounded a note of warning when he referred to the condition of one of his gasholders on viewing it from inside. He (Mr. Napier) trusted the experience was exceptional. Recently, in dismantling a gasholder, he found there was no evidence whatever of rust or corrosion present on the plates. He was inclined to believe that Mr. Wilson's experience was exceptional. Apart from the drums of station meters, they must all admit that in recent times the effect on the plates had been most serious. With reference to the guarantee contingent rate, he was distinctly of a different opinion to Mr. Wilson. When he considered that the rate was one which was imposed only when the price of gas would require to be raised to a point beyond what would be regarded as profitable to the undertaking, or in the interests of gas consumers—when they considered, on the basis of equity, that all ratepayers were not gas consumers—obviously it would be a mistake to tax those individuals who were not responsible for the consumption of gas. It must, of course, be admitted that in the case of loss in electrical undertakings they found the gas consumer mulched, although he had not contributed to any of the loss.

Mr. G. R. Hislop (Paisley) defined the paper as a very suggestive one. Mr. Wilson had raised certain questions that seemed a little alarming, especially that with reference to the rusting in gasholders. His own experience was that, with regard to the service-pipes choked in the oxidation, they had to have a staff of men cleaning them out. When he read the address, it occurred to him that what Mr. Wilson described was a very likely thing to take place. When it happened in service-pipes, it might affect the inside of the gas-works. With regard to the oil, he might state that half-a-century ago, in the case of Glasgow, he remembered that all the contractors for the secondary products thought they had a right to go into the gas-works and pump off an inch of solid oil in the spring time; and they considered this was a part of the bye-products they were entitled to. They tried the same thing on at Paisley. But he said: "Not one step further. You may as well come into the store and demand so many tons of coal." There was no doubt whatever that in these days the lower quality of gas made, with the absence of condensable hydrocarbons, caused the oxidation of service pipes and gasholders. If what Mr. Wilson had described was a general thing, it would become serious within not very many years. On the subject of purification, he sometimes thought it extraordinary that it was now 46 years since he preached Mr. Wilson's doctrine as to purification. He did not suppose there were many in the country who had adopted it. They had missed a very good thing in not turning the gas down through. He put up these larger purifiers—the largest in Great Britain at the time—in 1878. Only those who had tried the process could realize the enormous advantage that could be gained.

Mr. Alex. Wilson (Glasgow) considered the President was to be greatly praised for the way he had dealt with the various subjects of his communication. He had taken note of the state of the coke market at the present time. The stock of coke all over the country just now was a serious matter. He thought, however, that this would presently right itself. It would not do for all those round about to dump their coke into Glasgow. He did not consider this was quite fair. He thought if everyone tried to find as much outlet as possible in his own district he would increase the demand for coke so that they would all be as well off as they were before. He was not one of those who thought there was any use in cutting prices to increase the demand. A certain demand might be created in this way; but he did not think it was worth disturbing their market for that. What they had to watch was to keep the price of coke in relation to the price of coal. Of course, just now, when things were getting on the slacker side, there was a difficulty. Most of them would try to increase the sales in their own neighbourhood. Mr. Wilson had touched upon the question of retorts and chamber ovens. They had had a good deal of experience by this time of their verticals. He was looking forward to the day when they would only have verticals combined with chamber ovens. If they were going to get a better outlet for the coke for foundry purposes, he thought it would be wise to go in for chamber ovens in the larger works. It would be worth doing if it relieved the coke market. He did not agree with Mr. Wilson in his views on insurance. He had had to make a claim for insurance, and was therefore biased towards insurance just now. He thought most of them would see that, considering the high terms asked by the insurance companies, they were almost better to take up the responsibility themselves. Over a number of years, they would save by doing so. With reference to the oil on the water of the holder and in the meter, he thought it was worth a trial. If they put it in at the right time, it might save the rushes of naphthalene gases that occurred, and it would prevent the rusting of the holders and the service-pipes if they were to put in the oil at the right time of the year. Mr. Wilson had gone into the yield of ammonia very carefully. While the "pounds of sulphate per ton of coal" was not always a good criterion, it was a safe one. Speaking of the guarantee rate, such a thing had been spoken about in Glasgow for several years. Glasgow had spent a great deal of money in connection with the purification of the Clyde, which really did not matter very much to any particular citizen, but affected them all. They said that if money had been spent on purifying the river, why not on purifying the air? It had been proposed to levy a rate-in-aid for air purification—the rate to be paid to the Gas Department, to enable them to sell cheaper gas, and he hoped they would do it.

Mr. H. O'Connor (Edinburgh), referring to the liquor and tar per ton of coal, said he knew a small works in the East where the quantity of tar and liquor sold during the last three years was 70·1, 71, and 73 gallons per ton of coal. One curious thing that came out in this connection was the difference in the quantity of ammonia that was sold during certain quarters of the year. The quarter from July to September had always been less than the other three quarters. This quarter was only 73 to 78 per cent. of the maximum quantity sold in any one quarter. There were several things that might be the cause. One, of course, was that the tar and liquor lay longer in the tanks during the summer months; and if the evaporation was taking place in the tanks, they were losing strength and the scrubber had to be resorted to again. The temperature would always have an effect; the power of absorption of water for ammonia being reduced. With regard to the question of the rust in the gasholders, he had had some little experience in the effect upon meters. This was the action of the cyanogen upon the metal. Several times he had seen the plates of the station meters completely eaten through by this action. In all cases where he had made a test, he had found the water in the station meters was invariably of an alkaline nature. But Mr. Wilson mentioned that the water in the cases which came under his consideration was neutral. He had also seen a number of dry meters opened-up for repairs completely rusted inside. It was an important matter, not only for the plant in the gas-works, but also for the service-pipes and meters, that they should find out the exact cause of this oxidation, and find how it could be eliminated from the works.

Mr. T. Wilson (Coatbridge), when called upon, said he had had pleasure in reading his son's address before it was delivered. On the subject of the yield of ammonia, they had never less than 32 lbs. of sulphate per ton of coal carbonized. He thought this was due to the lower temperature at which they distilled. With

reference to purification, the other day he had occasion to deal specially with one of his holders; and while the outside showed no appearance of rust, the inside was wholly pitted. A few years ago, when they were purifying with lime, he opened a holder and found the inside hanging with a greasy substance, but no appearance of rust. Mr. Wilson, of Glasgow, took up a negative attitude regarding insurance. He could tell them that in Coatbridge they had insured their works for over thirty years. The first year they dropped it they had a serious explosion, and their purifiers were wrecked. Naturally they had insured once again. As to graduating the price of gas, he thought it was a wrong idea to have two prices. It should be to the interest of every company to sell their gas at the cheapest possible rate to outlying districts. In Coatbridge, they supplied a district four miles from them at the same price as to the Coatbridge consumer.

Mr. W. Blair (Helensburgh) complimented the President upon the condenser arrangement he had erected. Personally, he had always had a leaning to the horizontal condenser. So far as purification and the rusting of the inside of holders was concerned, he also thought it was pretty much due to the high temperatures at which they had been carbonizing in recent years. He had not opened any of their holders since they started using oxide of iron; but he knew they had corrosion in many of their recent mains. On the question of tar and liquor made per ton of coal, with the old horizontal retorts he was running from 48 to 54 gallons (5° Twaddel); but since introducing verticals, they had been selling 70 gallons (5° Twaddel).

Mr. W. M. Mason (the Secretary of the British Commercial Gas Association) said he had been at a meeting of his Association that morning, and one of the Glasgow Bailies said he thought the Association should deal with the technical side. If he had been there that afternoon, and listened to the excellent address and discussion, he would have changed his views upon this point. As regards the Association, they would all be interested in knowing that it was a huge success. They now represented, on the basis of gas make, practically 80 per cent. of the total gas made in the United Kingdom. They now had 440 subscribers, though this was only a fraction of possible subscribers. As regarded Scotland their position was improving, though it was not as satisfactory as some of them would like. They had only 33 out of 260 undertakings. But this was 33 members, representing 60 per cent. on the basis of gas made. As most of them knew, the annual conference of the Association—which was a very big conference, and one devoted to the salesmanship side—was, on the invitation of the Glasgow Corporation, to be held in Glasgow in the autumn of this year. He thought it a pity that though Scotland led at the beginning with regard to gas making, that they should not be in such a happy position regarding the salesmanship side. It would be to their interests to attach themselves to the Association. The Association was not a charitable organization—it was a business proposition. The gas manager had so many duties that the average man found it impossible to deal adequately with the salesmanship side of the question. The Commercial Association offered their help. Last year they had an income of £20,000. It was spent in advertising, and in pushing the sale of coke for one thing. They had a selection of 80 to 100 leaflets dealing with the various sections of the industry. In the production of such literature no ordinary gas company was going to face the expenditure. They had sold in the two years of their existence something like three million items—booklets, posters, &c. There was a feeling that the Association was a London concern run by Englishmen. This was not true. He himself, occupying the position of Secretary, was a Scotsman.

The President, commenting upon Mr. Mason's remarks, said that they recognized that it was the right thing to join the British Commercial Gas Association.

Mr. A. C. Young (Arbroath) resuming the discussion of the address, remarked that the quality of coal had a great deal to do with the amount of sulphate of ammonia that appeared in the balance-sheet at the end of the year. Notwithstanding what had been said, he was entirely convinced that the quantity of ammonia produced depended even more largely upon the kind of coal and upon the temperatures, than upon any special method adopted to conserve the ammoniacal vapours. Ten years ago they installed scrubbing plant and a tar-extractor capable of dealing with more than twice their output; and after the plant was put in use they immediately increased the yield of sulphate from 20 lbs. to 27 lbs. per ton of coal. In three years, without any new scrubbing plant, they increased their yield of sulphate to 30 lbs. Then during the following four years they gradually fell to 24·5 lbs. without any change of temperatures or scrubbing plant. They had a plant, however, in which they tested their coal; and his experience of the test plant proved that there was a large difference in the quantity of ammonia according to the quality of the coal. They tested their coal for ammonia and other liquid products, and so traced the increase or decrease in their total sulphate output for the year to be in accordance with the lesser or greater yields of ammonia shown in the test plant.

The President, at this point, read a letter from Mr. W. B. M'Lusky, of Halifax, regretting his inability to be present. He had read the paper, however, and wrote: "I have had experience like yours in the conservation of ammonia. We had to cool the liquor on its way from the hydraulic mains to the well in Perth; we also fixed Buchan traps on all pipe lines to prevent loss of ammonia. Your condenser experiences are most interesting; but one dare not dogmatize where naphthalene is under discussion. I placed the naphthalene washer on the station meter outlet, so that the solvent vapours went direct into the holder. Even then, the only solvent that effected a cure was the vapour from the residual tar produced in the manufacture of Pintsch's oil gas. We have no stock of coke. We sell 2-inch, 1⅛-inch, ¾-inch, and ½ inch nuts washed or dry screened. The washed is preferred for smithy purposes. The demand is good. You will find that porous coke made in the orthodox way in horizontal retorts will be selling at a premium once the production of hard, dense coke from packed horizontals, inclines, and verticals emphasizes by contrast the immense value of the old-fashioned Coatbridge brand. The increasing demand for Scotch coke—the porous pure product of the best coking seams of coal—proves that the buyer wants quality and bulk. Three years ago, prices f.o.b. Leith, Burntisland, and Methil were less than those of Hull and Liverpool. Last year the position was reversed; and to-day the best prices obtainable at Hull average only about 14s. 9d. f.o.b. One of the principal East Coast shippers informs me that coke from intermittent verticals is not wanted. Close observation shows that the system of carbonization employed must be carefully selected to produce the quality of coke which is required. Otherwise 'net coal less residuals' may not show the saving one is entitled to expect from the large capital expenditure involved. Works most favourably placed in relation to coal supply and equipped with vertical retorts should occupy a prominent position in the column of the 'Gas World' analysis of accounts which sets out the figure of 'cost of coal less residuals.' But an examination of these analyses shows that the lowest net costs are still obtained in works which have not yet adopted vertical retorts. Buying and selling will, of course, always affect the figure more or less; but the markets in which one may buy coal well and sell the residual products to advantage may be greatly restricted if we must buy a particular kind of coal to suit a particular condition in the carbonizing system. In such circumstances, one may have no alternative but to pay an enhanced price. In consequence of this, savings effected in increased yields of primary and secondary products and reduced labour costs may be neutralized."

Mr. J. Napier Myers (Saltcoats) expressed sympathy with Mr. Wilson's pious hope that the Government might do something to remove the difficulty between coal masters and miners; but he felt that, if they spent all their time on the matter, they would not settle the difficulty. He was amusingly surprised to find the socialist idea creeping into the address. Who would expect to see it creeping into the Informal Meeting of Gas Managers? The Government might nationalize the mines, nationalize the minerals, but surely not the industry. Also on the subject of purification, he was interested in the statement made four years ago by Mr. Hislop. He (Mr. Myers) was naturally so conservative that he did not readily depart from use and wont. The use and wont that had prevailed among them of carrying the gas up through the purifying material, must have some good reason for it. Mr. Hislop, in his statement, gave very good reasons for reversing the order. One of these was that in carrying the gas down through the material one had the whole of the material exposed to the action of the gas; whereas if one brought it up through, 50 per cent. of the surface was not exposed by resting upon the grids. The action of the gas going up through had a jointing effect upon the grids that carried the material. For some years he had aimed at overcoming the difficulty of the jointing effect of the material upon the grid by another method. At Saltcoats, to prevent the oxide jointing upon the grids, they screened out the nodules of the material and placed this next the surface that previously had the tendency to jointing. It answered the purpose of keeping the material open and preventing it becoming impervious to the passing of the gas. He found they could use their purifiers without causing back-pressure at all. His objection to adopting Mr. Hislop's suggestion would be that it would interfere with a little trick they practised in Saltcoats which enabled them to get through the winter without changing purifiers. He had realized this. In lifting the boxes, he had been suprised to find the surface of the material quite discoloured. Throughout the winter they raised the covers and disturbed the surface, and sprinkled a layer across the top so that they might have a further surface of material. In the portion of the boxes that was unfilled at the beginning, they gradually filled it by this method, which enabled the process of purification to be carried on more perfectly. To adopt the reverse action would prevent them doing this. He would still be in favour of carrying the gas in the old way from the bottom of the purifier upwards.

Mr. David Vass (Perth) explained that, after the New Year, they had taken to the canvassing of coke for domestic purposes. They had procured one of the circulars from the London Coke Committee. He was confident that if they kept on this way they would build up a strong local business for greenhouse and domestic purposes. They must be careful in the coal they selected to avoid anything like stones being present. They had sold bags of coke at 6d., and were now selling them at 4½d. Their procedure had been to circularize first and then send round a door-to-door canvasser for orders. He did not think that it was any use sending out circulars alone.

Mr. A. Waddell (Dunfermline) said they must also think what they did in carbonizing the coal to see that they got a good coke. Some of those who had not been taking so much gas out of the coal in the past found this a good way of doing so. Gas managers had found it to their advantage not to take the very last of the gas out of the coal, even for reasons outside the selling of coke.

He thought the rusting of the surface of the service pipes was an indication that their method of oxide purification had something to do with it. When there was no oxide used in the purification, they still had their service-pipes rusting. [Cries of "No" and "Yes."] His memory might be at fault; but he thought that he was right.

The PRESIDENT, in his reply to the discussion, said there seemed to be many different opinions as to insurance. His Council had considered the question fully. A year or two ago they wrote to a number of corporations throughout the country for opinions, and found that some had insurance funds of their own, others were not insured, while the remainder were insured. In connection with this matter, they had a very strong opinion from Mr. Herring at the time. He said that if it was a corporation undertaking he recommended it, because if anything happened somebody had got to be kicked. In their works at Falkirk they had had a case of spontaneous combustion in their coal-store. The insurance company had paid up in full, and had agreed to include spontaneous combustion in future. The companies said they had a good many cases of spontaneous combustion in Fifeshire, and in the bings in connection with the collieries. He had to congratulate Mr. O'Connor upon the excellent results obtained in the little works in connection with the sale of liquor per ton of coal. He was interested generally in the remarks made on the sale of coke. In Falkirk, during the last coal strike they considered the question of selling the coke, and resolved to give the coal merchant the option of selling it. They received over fifteen replies from merchants; and one was from a co-operative concern. Two other men followed. They took the opportunity themselves of sending out lorries; and these were kept going as hard as they could. He did not know that it paid them extremely well. The Corporation felt that the first concern was for the ratepayers, and they did not put up the price of coke to the figure at which he would have liked it. He was surprised at Mr. Myers' remarks in regard to purifiers. He thought if he tried the downward method he would never have anything else.

VOTE OF THANKS—A SCOTTISH JUNIOR HONOUR—NEXT YEAR'S PRESIDENT.

Mr. S. B. LANGLANDS having moved a vote of thanks for the address,

Mr. NAPIER said that, as Convener, the duty now devolved upon him of appointing in their name the successor to Mr. Wilson. This was an age of young men. The greatest honour to the Junior Associations of Great Britain had fallen to the Western District of the Scottish Junior Gas Association. One of their members had had the privilege and honour of being chosen to read the paper before the Institution of Gas Engineers at Liverpool in June next. The gentleman chosen for this honour was Mr. G. T. Purves, of the Auchengeich Coke-Ovens. He begged to nominate, as their new President, Mr. Dugald Currie, of the Airdrie Corporation Gas-Works.

DINNER.

The members afterwards sat down to dinner in the main hall of the Grand Hotel. Bailie SMITH, in the absence of Bailie Irwin, the Convener of the Glasgow Corporation Gas Committee, proposed the toast of "The Gas Industry." When he had the honour, two or three years ago, to read a paper before this gathering, he had then said that in the history of the gas industry the prospects were never brighter. To-day he still held to that opinion. The applications of gas were changing; but the necessity for a gaseous fuel that could be supplied by merely turning on the tap and applying a light was greater now than ever before. He was convinced that their methods of producing gas were not yet at finality. They had difficulty just now in getting rid of their coke; but he believed that in a few years this would be a valuable asset. In connection with air purification, in all the towns he looked to them to help the cause of air purification more than to any other aid. They had started very successfully a commercial gas undertaking. They must take this up and see that the gas appliances, when the public made the response to advertising, were properly fitted in.

Mr. G. R. HISLOP, when replying, said the toast embraced a very important subject indeed. Referring to competition, perhaps the process should be considered as a three to one keel in their advances against opposing forces. They were still on the war path. They tried to get a cheaper gas and tried to purify; they tried to champion the ideal of abolishing smoke by the introduction of gas-fires for domestic and cooking purposes. All these things were of vast importance to them. To compete with the times, the gas manager had to be continually thinking out these problems. It was a great difficulty that in the early days the works were shut up under the sign "No Admittance Here." But matters had changed; and they now had friendship and goodwill throughout the whole fraternity. No young man need hesitate to ask his fellows in order to get over a difficulty, and pile up knowledge, and in this way fit himself for a higher position when the time came.

Mr. H. O'CONNOR, in proposing the toast of "Kindred Associations," said that, as the founder of the Junior Associations in Scotland, he thought he had shown that he believed in the founding and the carrying-out of Associations of a kindred nature to their own. These Associations enabled the younger men to rise to their feet to speak and to contribute papers. They had heard that one who was recently a junior was to read a paper shortly before the Institution of Gas Engineers. In asking them to drink the toast of the "Kindred Associations," he would couple it with the names of Mr. Vass, the President of the North British Association, and Mr. John Wilson, the President of the Scottish Junior Gas Association (Western District).

Mr. VASS said he thought that the Junior Associations would be the places where in the future the papers would be read. Very soon they would have an amalgamation, when they would all come together.

Mr. JOHN WILSON remarked that there had been some agitation, especially in the South, in order that the juniors might be more closely connected with the parent Association. They in Scotland were really not so keen on becoming affiliated, because they thought the juniors should stand upon their own feet, and fight their own battles. It would in this way be easier to fight their own battles when they became seniors. Of course, they acknowledged, in all sincerity, the help of the senior Association.

PROFESSOR BONE ON SURFACE COMBUSTION.

Concluding Howard Lecture at the Royal Society of Arts.

The last of the Howard Lectures which Professor W. A. BONE, D.Sc., F.R.S., has been giving at the Royal Society of Arts [see "JOURNAL" for March 24 and 31, pp. 830, 896] was delivered on Monday last week, when the application of surface combustion to steam-raising in multitubular boilers was dealt with.

The lecturer introduced his subject by reminding his audience that for many years past there had been strong competition between the internal-combustion engine *plus* gas-producer and the steam-turbine *plus* boiler. At one time it seemed probable that the first-named combination would, in the long run, establish a marked superiority over its older rival; but he questioned whether to-day any decisive general advantage could be claimed for the internal-combustion engine. Mr. E. Kilburn Scott, who had recently dealt with the relative merits of the rival systems as prime movers for larger power stations, had expressed the opinion that "the steam-turbine is at present in an unassailable position." Professor Bone went on to say that whereas much has been done within the last twenty years to improve the mechanism whereby the energy of the steam is transferred into mechanical power, surprisingly little has been accomplished in the direction of increasing either the thermal efficiency or the rate of heat transmission in boilers. In the case of stationary land boilers, the engineer has been content with an efficiency of 70 to 75 per cent., with an hourly evaporation of from 5 to 8 lbs. per square foot of heating surface. Such a rate of evaporation represents a heat transmission of less than 1 per cent. of the maximum conducting capacity of the tubes; showing a wide margin for improvement. The present unsatisfactory state of things is attributable to the formation on the under-side of the tubes of a feebly-conducting and a practically stagnant film of gas at a relatively low temperature, which opposes a strong resistance to the passage of heat from the burnt gases to the water. The late Professor Nicholson demonstrated that the retarding influence of the gas film upon the transmission of heat might be diminished by greatly increasing the velocity of the burnt gases through the boiler tubes. But it has not been generally recognized by engineers that, inasmuch as gases are practically transparent with radiant heat, the best possible way out of the difficulty would be to make the fullest use of radiation, and to rely as little as possible upon the sensible heat of burnt products, as the driving force; for, so far as its influence upon radiant energy is concerned, the gas film may be considered as non-existent. The principal defects of the modern coal-fired boiler are (1) that, owing to the difficulty of ensuring intimate contact between the solid fuel in the furnace and the oxygen passing through it, a large excess of air, never less than 50 and often 100 per cent., is required to avoid incomplete combustion; (2) the general failure to take full advantage of radiation; (3) the comparatively slow velocity of the burnt products through the tubes of flues; and (4) the unnecessarily large losses by radiation and by conduction into the foundation, due to the needlessly large external radiating surfaces and the very massive brickwork setting in relation to the steam output. Professor Bone hoped to show his audience how all these defects were obviated in the new gas-fired "surface-combustion" boiler.

The lecturer then referred to the statement by Dr. George Beilby, in his evidence before the Royal Commission on Coal Supplies, that about 52 million tons of coal were then being converted annually into steam power. If the value of the recoverable ammonia and other products which were thus being lost to the community were considered, we ought not, he said, to rest content until the raw coal is subjected to some process for the recovery of such products before its fuel value is realized under boilers. This was perhaps looking a long way ahead. Nevertheless, there are now available three important sources of gaseous fuel which ought, in Professor Bone's opinion, to be utilized on an increasing scale for power purposes—viz., (1) blast-furnace gas, (2) coke-oven gas, and (3) producer gas which is manufactured under ammonia-recovery conditions. With regard to the first two, he had calculated the thermal efficiency of the gas obtainable per ton of pig iron produced as equivalent to the heat of combustion of about one-third of a ton of coal. This on the present annual output of pig iron, would be equivalent to about 3½ million tons of coal per annum, all of which might be immediately available for power purposes. As to the third source—producer gas—the cost of generating gas of the net calorific value of 145 B.Th.U. per cubic foot from coal at 15s. per ton would probably be about 1d. per 1000 cubic feet, including all capital charges, interest, and redemption. The cost of supplying to a boiler a million net British thermal units in the form of gas would be about 7d. The lecturer put this question: "Can a gas-fired boiler be constructed

which will transmit to the water a much larger proportion of the million heat units supplied to it than would the coal-fired boiler?" If this question could be answered affirmatively, as he thought it could, then the proposition of first gasifying the coal under ammonia-recovery conditions, instead of using it in the raw state in the boiler, became commercially feasible. It had been estimated by a prominent blast-furnace engineer that the thermal efficiency of the best type of water-tube boiler fired by blast-furnace gas does not exceed about 55 per cent., while in the case of boilers fired by coke-oven gas the average efficiency probably lies between 60 and 65 per cent., and would rarely, if ever, exceed 70 per cent. It was the contemplation of the "really wicked" inefficiency of boilers fired by blast-furnace gas which came under Professor Bone's observation some years ago that first impelled him to transfer his researches upon surface combustion from the laboratory to the factory; and he proceeded to show how, on applying the new principle to the firing of multitubular boilers, he had been able to obtain results, with coal gas and coke-oven gas, corresponding to the transmission of 92 to 94 per cent. of the net calorific value of the gas to the water in the boiler, together with an enormous gain in the rate of evaporation as compared with the best contemporary boiler practice.

The Evolution of the Bonecourt Boiler.

The lecturer then proceeded to explain, by the aid of lantern slides, how, as the result of experiments in Leeds with a single steel tube, 3 feet long and 3 inches diameter, packed with fragments of granular material, meshed to a proper size, he had been led to construct an experimental ten-tube boiler. With the single tube, it was found possible to completely burn a mixture of 100 cubic feet of coal gas *plus* 550 cubic feet of air per hour, and evaporate about 100 lbs. of water from and at 100° C. (212° Fahr.) per hour —20 to 22 lbs. per square foot of heating surface; the products leaving the farther end of the tube at practically 200° C. This meant the transmission to the water of 88 per cent. of the net heat developed by the combustion, and an evaporation per square foot of heating surface nearly twice that of an express locomotive boiler. The combustion of the gas was completed within 4 or 5 inches of the point at which it entered the tube. Of the total evaporation, no less than 70 per cent. occurred over the first linear foot of the tube, 22 per cent. over the second foot, and only 8 per cent. over the last foot. This, said the lecturer, pointed to a very effective radiation transmission from the incandescent granular material in the first third of the tube, where the zone of active combustion is located, though he pointed out that the *loci* of actual contact between the incandescent material and the walls of the tube are so rapidly cooled by transmission of heat to the water on the other side that they never attain a temperature even approaching red heat.

Having satisfied himself as to the efficiency of the fundamental unit as an evaporator, the ten-tube boiler was constructed. In a trial run at Leeds on Dec. 8, 1910, with coal gas of 562 B.Th.U. net, and evaporating at the rate of 21·6 lbs. of water from and at 210° Fahr. per square foot of heating surface per hour, the ratio of the heat utilized to the net heat developed in the tubes was 0·943. This remarkable result was, however, eclipsed in an independent trial carried out by some German engineers in London on Jan. 8, 1913, when, with coal gas of the net calorific value of 510 B.Th.U. per cubic foot, and evaporating at the enormously high rate of 33·9 lbs. from and at 212° Fahr. per square foot of heating surface, the ratio of the heat utilized to the net heat developed by combustion was 0·933. Professor Bone pointed out that it is one of the outstanding merits of the new system that the gas can be completely burnt with a minimum excess of free oxygen. During the trial on Dec. 8, 1910, the average proportion of carbon dioxide in the products of combustion was as much as 10·6 per cent., while the oxygen was as low as 1·6 per cent. A most careful examination of the products failed to reveal the presence of the slightest trace of carbon monoxide, hydrogen, or methane.

The Boiler at the Skinningrove Iron-Works.

Six months' continuous experience with the first experimental unit gave Professor Bone and his colleague (Mr. C. D. M'Court) so much confidence in its reliability that they had no hesitation, when they received an inquiry from the Skinningrove Iron Company, Limited, for a boiler about ten times the capacity of the experimental unit, to be fired by means of the surplus gas from their new Otto bye-product coking plant, in accepting a commission to instal their first large boiler there, under a strict guarantee as to its output and efficiency. The boiler was built by Messrs. Richardsons and Westgarth, Limited, of Middlesbrough, to the design of Mr. Michael Longridge. [The lecturer then described by means of lantern slides the boiler, of which particulars have already been given in the "Journal."*] The plant amply fulfilled the guarantee, and it was taken over by the Company.

Results of Independent Trials of the Boiler.

At the end of July, 1912, after altogether five months' actual running, exhaustive trials were made under the personal superintendence of an eminent American steam engineer, who had come to England expressly to investigate the boiler; and he reported the following results of a ten hours' steam trial on July 29, 1912. The ratio of heat utilized to that supplied was 0·927; but the boiler was not lagged, otherwise this figure would have been about 0·94. The power taken by the fan (20-inch suction) was 6097 watts, or 8·2 H.P. Compared with a coal-fired marine boiler, the heat utilized was 92·7 against 75·1 per cent., and the rate of evaporation 14·1 compared with 4·3 lbs. per square foot of heating surface. Notwithstanding the intensity of combustion and the high rate of heat transmission, the boiler-tubes did not show any signs of deterioration after five months' continuous running.

Mean steam gas pressure per square inch above atmospheric	97·2 lbs.
Total gas burnt	101,853 cub. ft.
Net calorific value of gas per cubic foot	510·5 B.Th.U.
Total net heat supplied	52,003,996 ,,
Temperature of products leaving boiler (196° C.)	386° Fahr,
Temperature of products leaving feed-water heater (94·6° C.)	202° ,,
Total water evaporated from and at 212° Fahr.	49,824 lbs.
Evaporation per sq. ft. of heating surface per hour	14·1 ,,
Dryness of steam	99·3 p. ct.
Total heat utilized	48,208,399 B.Th.U.

Professor Bone at this point referred to the installation of a boiler similar to that at Skinningrove in connection with one of Krupp's coking plants in the Ruhr district of Westphalia, mentioned by him in his Royal Institution lecture; and he emphasized the remarks he then made by way of protest against his boiler being taken as part of a German invention, as represented by the technical press in that country.

General Considerations about the Boiler.

In bringing his lecture to a close, Professor Bone remarked that he had perhaps already said enough about the boiler and its working to convince his audience that it at least gives promise of combining structural simplicity, high thermal efficiency, and concentration of power in a unique degree. But there were certain important general considerations which he thought ought to be further discussed. First, from the constructional point of view, what, he asked, could be simpler or more compact than a cylindrical shell, only 4 feet long by 10 feet in diameter, traversed by straight tubes, supported on a casting, and requiring neither elaborate brickwork setting nor expensive chimney flues and stack. Secondly, it had a further advantage over all other multitubular boilers in that the front plate could never be heated beyond the temperature of the water, however much the firing might be forced—a circumstance which, coupled with the extremely short length of the tubes, implied an absence of strain, and greatly reduced the risk of leaky joints. Thirdly, the high rate of mean evaporation obviated scaling troubles; and the very steep evaporation gradient along each tube caused a considerable natural circulation of water in the boiler—a factor of great importance from the point of view of good and efficient working. In this connection, he reminded his audience that, under normal working conditions, he obtained a mean evaporation of 20 lbs. per square foot of heating surface per hour, and could, if necessary, force this up to 35 lbs. Of this total evaporation, 70 per cent. occurred over the first third length of the tube, 22 per cent. over the second third, and only 8 per cent. over the last third. Fourthly, inasmuch as each tube of the boiler is, so to speak, an independent combustion unit, capable of being shut-off or lit-up without affecting the others, and as it only takes five minutes after lighting-up a cold tube to attain its maximum steam output, it is obvious that not only is such a boiler highly responsive to rapid variations in the load, but also works with equal efficiency at both small and large loads. Indeed, within very wide limits, the efficiency of the boiler is practically independent of the load.

In conclusion, Professor Bone said he had endeavoured to trace the history of an idea from its inception in the laboratory through its experimental stages up to its successful technical application; and he hoped he had succeeded in convincing his audience that there had been laid a sound foundation upon which an enduring edifice might be reared.

On the proposal of Sir Henry Trueman Wood, who had presided at the lectures, a very hearty vote of thanks was accorded to Professor Bone, who in briefly acknowledging it expressed his indebtedness to the Gas Light and Coke Company and members of their staff for the assistance they had rendered in carrying out the arrangements for the experiments incidental to the lectures.

* See Vol. CXVII., p. 27.

Examination for Smoke Inspectors.

It has been urged upon the Council of the Royal Sanitary Institute that there is need for some certificate of qualification for smoke inspectors, such as would indicate that they have a practical as well as a theoretical knowledge in the subjects of which it is necessary they should be cognizant in order to enable them satisfactorily to carry out their duties. We learn from the Secretary and Director of the Institute (Mr. E. White Wallis) that, to meet this demand, and to afford an opportunity to inspectors in office and others of obtaining an evidence of qualification in the practical and administrative duties of this position, the Council have decided to arrange a special examination and to award certificates. It will be held in London on the 24th and 25th inst., and possibly again on the 11th and 12th of December; and between these dates it is proposed to hold examinations in Manchester, Leeds, Birmingham, Sheffield, and Newcastle.

MANCHESTER JUNIOR GAS ASSOCIATION.

Fifteenth Annual Meeting.

The Fifteenth Annual Meeting of the Manchester and District Junior Gas Association was held on Saturday at the Grosvenor Hotel, Manchester. Upwards of sixty members were present, and there were several representatives of the Manchester District Institution of Gas Engineers.

The PRESIDENT (Mr. W. L. Heald, of Preston) briefly opened the proceedings, and said he was glad to be able to inform the members that the membership of the Association was stronger now than it was twelve months ago. It was stronger, too, in other ways—in the type of man admitted to membership and financially—than it had ever been.

After letters of apology for non-attendance had been read,

The PRESIDENT called upon the Hon. Secretary (Mr. J. Bridge, of Stretford) to read the minutes of the previous annual meeting, and they were unanimously passed.

ANNUAL REPORT AND BALANCE SHEET.

The HON. SECRETARY then read the annual report of the Council. It was stated therein that during the year 24 new members had been admitted, being ten more than in the year 1912-13, and six had resigned. The membership stood now at 168—a net increase of 18. The Council reviewed the work of the year in regard to the papers read, the visits paid, and the Manchester University lectures. Reference was made to the meeting of the English and Scottish Junior Associations at the National Gas Exhibition in London in October last, and to the visits to works which was an enjoyable feature of it. It was mentioned that the rules of the Association had been revised so as to admit persons engaged in coking and power-gas works. Mr. Samuel Tagg, of Preston, had offered to award two prizes of one guinea each for the two best papers of criticism relative to the visits made during the session; but the number of members who had sent in papers was very low. One prize had been awarded to Mr. H. Dumbleton, and the other to Mr. J. Brown. The Council of the Institution of Gas Engineers had, through the President (Mr. E. Allen, M.Inst.C.E.), extended an invitation to the Junior Associations to contribute a paper on the annual meeting at Liverpool in June, to which the members would be invited; and the British Commercial Gas Association had recognized the Association by electing the President and Hon. Secretary to seats on the District Conference Committee.

The PRESIDENT, in moving that the report be accepted, said it was very gratifying to learn from it that the membership had increased by eighteen. The alteration of the rules, however, had not helped them to any great extent as yet—only four new members having been admitted in consequence. It would, he thought, be another twelve months before much development took place. The papers read at the meetings and the visits to works had been highly educative; and those who had missed them were certainly the losers. The attendances at the University lectures had not been quite so good as in the previous year. Referring to the prize scheme, he expressed his keen disappointment at the number of papers sent in. They would not, however, let the matter drop, as Mr. Thorp had offered two prizes of similar value to those given by Mr. Tagg; and he asked the members to redouble their efforts for the next session. In conclusion, he referred to the invitation of the Institution of Gas Engineers for the contribution of a paper at the forthcoming annual meeting. The notice had been somewhat short; but he had no doubt that if the offer were renewed earlier next year there would be a better response.

Mr. J. ALSOP (Stockport) seconded the motion, and it was carried unanimously.

The HON. TREASURER (Mr. J. Robinson, of Altrincham), in moving the acceptance of the annual balance-sheet, said the total income amounted to £52 0s. 1d., and the expenditure to £35 2s. 4d.; leaving a balance of £16 17s. 9d. He said this was the first good balance-sheet they had had since 1908-9; and he felt very proud of it.

Mr. R. H. GARLICK (Salford) seconded the motion, and congratulated Mr. Robinson.

The accounts were passed.

OFFICERS FOR THE ENSUING YEAR.

The election of four ordinary members of the Council then took place. The retiring members (who were all eligible for re-election) were Messrs. W. H. Cummins (Manchester), F. Dean (Altrincham), and A. Hodgson (Hurst). The result of the ballot was that they were retained on the Council; and Mr. J. W. Nichol (Radcliffe) was elected a member. These gentlemen, together with Messrs. Alsop, F. H. G. Goodwin, B.Sc. Eng., A. L. Holton, and C. E. Woodhead constitute the Council. There were seven nominations for the office of Vice-President; and Mr. Carter (Garston) was unanimously chosen for the position. Mr. Bridge and Mr. Robinson were respectively re-elected Hon. Secretary and Hon. Treasurer; and Mr. S. E. Halliwell (Littleborough) was appointed representative of the Manchester District Institution on the Council of the Association.

Thanks were accorded to the retiring Council, upon the motion of Mr. J. M'NICHOLL (the incoming President), seconded by Mr. C. BERRY.

Mr. A. L. HOLTON acknowledged the vote.

INTRODUCTION OF THE NEW PRESIDENT.

The OUTGOING PRESIDENT said he had the greatest possible pleasure in asking his successor—Mr. Joseph M'Nicholl, of Warrington—to address the members. Before vacating the chair, however, he desired to say that he had had a very happy year of office. It was true that there was a good deal of responsibility in it; but he had endeavoured to shoulder it to the best of his ability. He felt he was a better man to-day than he was twelve months ago when elected to the chair; and if the members who had not attained office would take his advice, he would strongly recommend them to aspire to the position he was now leaving. It was their duty to themselves and to the profession they were in.

Mr. M'NICHOLL then took the chair amid the cordial applause of his colleagues.

THANKS TO THE PAST-PRESIDENT.

The PRESIDENT, replying to Mr. Heald and the members generally, thanked them for the cordiality of their welcome, and said his first duty was the pleasant one of offering the hearty thanks of the members to Mr. Heald for the able manner in which he had presided over the destinies of the Association during the past year. The dignity of the presidential office had, without the slightest doubt, been enhanced.

Mr. HEALD acknowledged the thanks of the members, and said he was leaving the chair with some little regret and also with some pleasure—with pleasure, because he thought that during his term of office the Association had been recognized among the Senior Associations, and also because of the financial position of the Association and the membership figures. He had tried to do his duty in an unostentatious manner; and he was glad his efforts met with the approbation of his colleagues.

The PRESIDENT then delivered the following

PRESIDENTIAL ADDRESS.

Gentlemen,—Reviewing the proceedings of this Association for the session just completed, I think we can justly congratulate ourselves on the work accomplished. In addition to the annual meeting and presidential address, we have had four University Lectures, four visits to works, three excellent papers, and four interesting discussions on various topics. The visits to works continue to be the most attractive feature of our programme, judging by the members attending. The number who attend the Saturday afternoon lectures is very disappointing, and not calculated to encourage your Council to further develop this most important means of higher education.

When the Junior Associations were only one or two years in existence, there were many who predicted that the pace at which they started off could not be maintained, and that their somewhat ambitious programmes would soon have to be considerably curtailed. But, contrary to these predictions, we find, after fifteen years of vigorous life, this Association is going more strongly than ever; and what is true of the Juniors in this district is equally true of all the other Junior Associations. This pace cannot be maintained without a considerable effort on the part of your President, Secretary, and Council; and I trust the body of the members will realize this and come forward with suggestions for this session's programme, and especially that those who have the time and opportunity to prepare papers for discussion will communicate with the Secretary at the earliest possible moment.

A very important feature of last session's work was the amendment of Rule 4, which enlarged the scope of membership to embrace those in charge of coke-oven and power-gas plants.

THE COKE PROBLEM.

When I began to think seriously of my position and to look round for a subject, or subjects, on which to address you to-day, I felt that two courses lay open to me. The first, and in my opinion the most desirable one, was to choose a subject on which I could concentrate my efforts. The second one, which I considered only as an alternative, was to "box the compass"—as many who as a last resort when thrust into positions such as mine are compelled to do. After considering many subjects and making notes on several, I was drawn by the sight of our accumulating coke stocks to devote some of my attention to the coke problem. I then thought that I should be justified in making this, our staple bye-product, the subject of my address, especially as the problem was not a local one, but one that was exercising the minds of the heads of gas undertakings throughout the country to a greater degree than all the other bye-products put together. I have since partially regretted my choice, after reading some of the voluminous matter that has recently been written on the same subject, doubtless by others who, like myself, have been driven by circumstances to devote their attention to it. My excuses then, if excuses are needed, for bringing this question before you to-day are: That so far as I am aware it has not been brought before any of the Junior Associations, and, further, the urgency of the problem is such as to demand the attention of all who have the interest of the industry at heart.

When the market is glutted with any commodity, the obvious remedy is to reduce the output; but, unfortunately, with bye-products this is not possible, though in the case of coke the amount placed on the market can be controlled to some extent. The other alternative is to direct the surplus production into other channels—to find new markets for it; and to accomplish this it is necessary to enter into competition with the particular fuel which

at present holds the field. To do this successfully, it is essential that we observe the methods of the successful merchant who has something to introduce with a view to business. First of all, we must make ourselves familiar with the needs of our prospective customers, and be prepared to prove that we can supply their requirements to their advantage. This implies a practical knowledge of the value of our own goods and those of our rival competitor. Then we must exhaust every practical and legitimate method if necessary to bring the good qualities of our goods to the notice of those with whom we desire to do business; and if at the outset our efforts do not meet with the success we know they deserve, then we must persevere and so command success.

I cannot help thinking that if gas companies and corporations had tackled this question by the same methods which they were practically compelled to adopt to push the sale of gas, the state of the coke market would be very different from what it is to-day. Just try to imagine a gas company with a representative calling upon all and sundry and soliciting orders for hundredweights or hundreds of tons of coke, and offering to supply samples and give instructions as to its intelligent use. Similar proceedings were adopted to popularize the use of gas, and colliery owners have their agents and canvassers, although they do not carry their endeavours quite so far as I have indicated. I think the Oldham Corporation, in engaging hawkers to take coke round the town in small quantities, made a step in the right direction; and I regret to have read that this practice had been discontinued owing to its non-success. Nevertheless, I trust that the failure of Oldham to popularize the use of coke will not deter others from making a similar experiment. If the coke is broken to a convenient size, is moderately dry, and, what is most important for the purpose of successful introduction, is retailed at a reasonably low price, I think in the end it is bound to win its way to a more general use in domestic fires. Bulk for bulk it could be retailed at less than half the price of coal; and this is a point that must tell in its favour. Coke is certainly not so easily ignited as coal, but when once properly "set going," there is this to be said for it—the whole mass is glowing and radiating heat, and there are no dark spots such as are to be seen in coal-fires. In addition to this, owing to the lower specific gravity of coke the area of its radiating surface is at least 50 per cent. in excess of that of coal when equal weights of each are compared.

RELATIVE VALUE OF COKE AND OTHER FUELS.

With the object of obtaining information of the relative value of our own coke and the other fuels used in this district for steam raising, we have made a number of tests of each for calorific power and percentage of ash. It was my intention to make these tests on a practical scale; but on going into the matter, I found that for the tests to be of any real value I would require more apparatus and time than I had at my disposal. My intention was to obtain samples of the different fuels used in this district for steam-raising, to weigh carefully the quantity of each consumed by a steam-boiler over (say) twenty-four hours, and to take records of the temperatures of feed-water and flue gases, and also carbon dioxide in the latter, pressure of steam, and quantity of water evaporated. The duty of each fuel could thus be obtained and much other useful information on the behaviour of each fuel acquired. I am aware that tests somewhat on these lines have been made in other places; but I think it is essential that comparative tests of this character to be of real value ought to be made in each district—preferably in each town—on the local coke and other fuels in use for steam-raising.

There is no doubt that many firms are guided in their selection of fuels by their mechanic in charge, or even the boiler attendants themselves, and the factor that weighs most with them (and if balanced with costs justly so) is the amount of clinkering required, and tests such as I have outlined would enable one to enlighten prospective customers as to the merits of coke and meet half-way any objection that might be urged against its use. Coal or slack has been used almost exclusively for firing purposes so long unquestioned, that any attempt to supplant it will be met with the strong opposition which invariably meets any attempt made to upset the existing order of things.

Below are the results of a number of tests on some of the best slacks used in this district for steam-raising. The calorific tests were made with a "Roland Wild" calorimeter:—

No.	Ash Per Cent.	Calorific Value B.Th.U.	Water Evaporated Lbs.	Price at Colliery.
1	2·5	14,200	14·68	11s. 6d.
2	6·0	13,400	13·85	9s. 6d.
3	9·0	12,850	13·29	9s. 6d.
4	10·5	12,800	13·23	8s. 6d.
5	14·5	12,550	12·98	8s. 0d.
Averages .	8·5	13,160	13·61	9s. 5d.

The following tests were made on coke from representative slacks as used for gas making in this district:—

No.	Ash Per Cent.	Calorific Value B.Th.U.	Water Evaporated Lbs.
1	8·25	13,600	14·06
2	10·00	13,000	13·44
3	10·5	13,100	13·54
4	11·25	12,600	13·03
5	9·5	13,000	13·44
Averages .	9·9	13,060	13·50

If the value of any particular fuel for steam-raising were directly proportional to its calorific value as obtained under laboratory test conditions, then it would follow from the above tests that the price of coke should be 0·76 per cent. less than that of an average slack (for all practical purposes they may be considered equal), *plus* the cost of carriage from colliery to town. But we have only to look at the chimneys of factories where coal is the fuel used to see how a large proportion of the heat uuits is dissipated. This and other disadvantages of what may be termed the "fat" variety of fuels have already been dealt with in the literature of the British Commercial Gas Association and the London Coke Committee.

The calorific value of a fuel is dependent on the amount and character of its combustible constituents, of which carbon constitutes from 94 to over 99 per cent. Pure carbon has a value of about 14,500 B.Th.U., and the value given for coal in text-books is 12,000 to 15,000 B.Th.U. But I am quite sure the latter figure is rarely, if ever, obtained. If tenders were invited for coal of a guaranteed calorific value of over 14,000 B.Th.U. it would surprise me very much if many firms could be found to respond to the invitation.

There is evidently no definite ratio between the percentage of combustible matter in coal or coke and its calorific value. That this is so is to some extent obvious, as the composition of the combustibles varies in different fuels; and it is also true that the value obtained by calculation from its ultimate composition in many cases differs widely from that obtained in a calorimeter—too widely to be due to experimental error. The causes which upset what, on the face of it, ought to be a case of simple mathematics have not to my knowledge been agreed upon—the composition and character of the ash and the physical character of the coke are among the causes put forward.

CALORIFIC TESTS.

It will be noted that all calorific tests presume the fuel to be dry, and no allowance is made for moisture. I have no doubt it will occur to many of you that coal would score another point if this were taken into consideration. In many, and in probably the majority of, cases this would be so; but I think it is within the limits of practical working to supply coke almost free from moisture. In Warrington, there are two methods of coke-handling employed. In the first, the coke is drawn from the retorts into iron bogies, wheeled to a loading stage, and tipped; it is then slaked by water being directed over it from hose-pipes, and either thrown by shovels into skips, which are afterwards emptied into storage-hoppers, or into stock in the yard, or is loaded by means of forks into waggons. This coke, of course, has to be thoroughly slaked, and when tested I have found it to contain from 3 to 15 per cent. of moisture. In the other method (which deals with more than half of our production), the bogies of coke are placed under water-sprinklers, and then tipped in shallow layers over the coke yard, from whence it is loaded by hand into carts. From numerous tests made on the coke dealt with in this way, I have found it to be particularly free from moisture; and in one or two instances the coke was found to be absolutely dry.

At first sight it seems incredible that the coke should be dry after undergoing a very severe shower bath; but the reason is a perfectly simple one. When the coke comes from the sprinkler apparently quenched, it is really only the outer layers that have been subdued. The heart of each lump is still at a high temperature; and this residue of heat is quite sufficient in many cases to evaporate the final traces of moisture. Of course, it would be quite easy to over-slake the coke by this method; but in our case the difficulty is to get it sufficiently slaked owing to the rate at which it has to be dealt with. This method of dealing with coke is not conducive to high sales per ton of coal; but I am strongly of opinion that the financial returns of any undertaking would not suffer by the adoption of any suitable method of coke quenching that would do its work with a minimum of water. The readiness with which coke absorbs water is well known, and I have found pieces of coke when over-slaked to contain as much as 20 per cent. of moisture. Washed coke I have found contains from 20 to 23 per cent. just after leaving the washing-tank; but after a day or two in stock this is considerably reduced. I have made several tests on coke from two or three heaps which had been in stock and open to all weathers for at least a month, but in no case was I able to obtain a sample containing more than about 10 per cent. of water.

The effect of the presence of moisture in coke is to reduce its calorific value by an amount equal to the percentage of water present; and in addition there are further losses, due to the heat taken from the coke to evaporate the water and to raise the steam generated to the temperature of the furnace, or rather the waste gases, as the steam would give up some of its heat in passing through the flues. These latter losses, however, are small compared with the direct loss due to the displacement of fuel by water. If we take a sample of coke with a calorific value of (say) 13,000 B.Th.U. then I estimate that the loss of heat units due to the presence of (say) 1 per cent. of water would be as follows:—

1 per cent. of 13,000	=	130
1 per cent. of total heat of evaporation of 1 lb. of water (1118)	=	11·2
1 per cent. of heat required to raise temperature of steam from 1 lb. of water to temperature of flue gases, say 600° Fahr. (186)	=	1·8
		143·0 B.Th.U.

Roughly, the presence of 9 per cent. of moisture reduces the calorific value 10 per cent.

WASHED COKE.

There is in many towns a good outlet for small washed coke for smithy fires; and I know of several firms who, having been induced to try this class of fuel, will not have any other. In Warrington we do not as yet break coke to meet this demand, but will undoubtedly have to do so in the near future. The whole of our production of breeze is screened over a $\frac{5}{8}$-inch screen, and what passes over is washed. The screenings and rejected washings are consumed in our own boilers. It is astonishing how small is the proportion of light coke one obtains from the washing. In a recent test we obtained from one ton of breeze:—

Screenings	9·0 cwt.
Heavy coke	8·7 ,,
Light coke	2·3 ,,
	20·0 cwt.

The cost of washing per ton of light coke worked out at about 6s. This is a very high figure; but as it is retailed at a price 8s. in excess of that of coke, there can be no doubt as to whether or not it is a paying venture. The quantity, of course, varies with the quality of coal used, and also the method of washing. Our washing is performed by hand. I understand, however, that with machines a greater quantity of light coke is recovered; but the quality is not equal to that obtained by hand washing. If broken coke were washed instead of breeze, there is no doubt that a much greater proportion of light coke would be obtained. Coke breeze is evidently a drug in many works. I have known it to be delivered by rail in Warrington, after having been brought a considerable distance, at 1s. 8d. per ton less than our yard selling price. The reason why we are able to keep our price up is that we have very little for disposal, owing to our being able to use practically the whole of our production on the works. The bulk of it is employed for steam-raising, but a considerable portion of it is also used in the retort-house.

The illuminating power of the gas supplied in Warrington is 16½ candles by the No. 1 argand and to maintain this quality two courses are open to us. We can either make straight coal gas of this quality by working moderate heats, and, of course, being content with moderate makes per ton, or we can by keeping the heats up obtain higher makes per ton of poorer quality and then enrich. The former course is the one we adopt, and when the retorts show a tendency to become too hot, instead of lowering the heats by the usual methods, the producers are partially fired with breeze. In our case the handling of the breeze in this way is a very small item. It is taken from the screens by our own locomotive and emptied from the high-level railway in the coal-store into a hopper fixed underneath the rails. A shoot from this hopper passes through the wall into the retort-house just high enough to deliver into barrows, which are loaded and then taken and tipped to the producers as required.

COKE-HANDLING PLANT.

We are at present erecting additional storage hoppers in our retort-house for an installation of power stoking machinery, to take the place of West's manual machines which have been in use for the past twelve years; but we have not definitely decided what system of coke handling we shall adopt to work in conjunction with it. What is wanted is a method of coke handling that will not only do its work cheaply, but that will deposit the coke into waggons with a minimum amount of moisture and without any risk of subsequent firing, and also with a minimum amount of breakage. I think a suitable modification of the coke-quenching, loading and screening machines employed on coke-oven plants could be devised to run on rails in the retort-house and deliver coke direct into waggons or skips under the stage floors. The makers of these machines whom we approached were hopeful of being able to meet us in the matter; but on going into it more closely they were faced with several difficulties, which so far as I am aware they have not yet been able to overcome.

We are at present trying to devise a method of quenching, loading, and screening to work in conjunction with a telpherage system. Instead of immersing the skips in a water tank, it is proposed to deposit their contents on to an elevated platform in shallow layers in a hot state, or after being partially quenched, and any further quenching required performed by means of hose-pipes. The coke platform would be arranged to tip its contents, when sufficiently cooled, over screens placed immediately underneath and into waggons or skips. I regret that I cannot give any more information as to this scheme at present, as the idea is of recent conception, and it is only in the rough sketch stage of development.

EDUCATIONAL METHODS.

I should have liked to have dealt with one or two other matters to-day; but I could not in justice to myself or the subjects, without inflicting on you an address of inordinate length. It would be an easy task for any one of us who in the course of his career has been humbugged by the system, or rather lack of system, in our educational methods, to air his grievances and bring to bear on this subject a good deal of criticism both destructive and constructive. However, our methods have been considerably improved during the last few years, and what the youths of to-day chiefly want is the kindly interest of those who, by reason of their ripe experience, can direct their studies into the proper channels and prevent them from wasting valuable time in the pursuit of knowledge which, however useful it may be in other spheres, is of no practical use in their profession. I do not want the remarks just offered to be taken too literally. There are many subjects that, to my mind, are essential, although they do not bear immediately on the technics of the gas or any other industry. Each of us has to live a portion of his life away from the office, shop, or works; and the exigencies of any profesion should not be allowed to deter one from attending to his general culture and the social side of his character. What I want to emphasize is the importance of students eager in the pursuit of knowledge having their energies trained in the direction best calculated to fit them for the positions to which they aspire.

There is just one long-felt want to which I should like briefly to refer, and that is of thoroughly up-to-date works on gas engineering and chemistry. Most of the books on gas manufacture have been written by chemists and considered as text-books to enable students with little or no practical knowledge to pass an elementary examination. I have no fault to find with them; but as an aid to the "man on the works" they are mostly sadly deficient. For instance, we do not hope to learn much about stoking machinery in books of this character, and such descriptions as are given are only of academic value. To do justice to this subject, it would require a volume to itself, which to be of any value would have to be written by a competent engineer with a large and varied experience in the working of the machines. Then, again, the books on the chemistry of gas manufacture are in many instances notoriously lacking in detail. I contend that a description of any particular test ought to be sufficiently comprehensive to enable anyone with only a moderately advanced knowledge of chemistry to perform the test, and to overcome any of the ordinary obstacles that might be encountered owing to peculiar conditions of testing, without having to find the cause by repeated experiments or by references to other works. I am aware that there are many who do not agree with me in this, and who contend that a mere outline of the test is all that is required by an experienced chemist. I am not thinking, however, of those who have specialized in this branch of the profession, but of the majority whose duties range over a wider field. I believe that a considerable number of chemists would also like to see a fully detailed work, as unless a test comes into the ordinary routine it is the easiest thing in the world to omit some minor detail, which means that the test has to be repeated, and so much time wasted. What in my opinion is wanted is a really comprehensive work on "Modern Gas Practice," on the lines of a work known by a similar name in the electrical industry, compiled by men of undoubted ability in the various branches and under the direction of a capable and exacting editor.

THANKS TO THE PRESIDENT.

Mr. ALSOP moved a vote of thanks to the President.

Mr. W. FLETCHER (Liverpool) briefly seconded the motion and it was heartily carried.

PRESENTATION OF MR. TAGG'S PRIZES.

After tea had been partaken of, the members assembled for the smoking concert. In the course of subsequent proceedings,

The PRESIDENT called upon Mr. Tagg to present the awards gained in response to his prize scheme.

Mr. TAGG said his idea in offering the prizes was that it would add more zest to the visits the members paid to various works during the year. The social side of their gatherings was, of course, always attractive. But it was most important, when visits were being paid elsewhere—to other gas-works, for instance—that members should bring back some definite idea of what they had seen; and the practice of committing to paper notes of any little matter which had impressed them during such visits was very helpful, and worthy of encouragement. Referring to Mr. Heald's expression of disappointment as to the smallness of the number of papers sent in, he assured the members that he did not quite share it, because it was rather a difficult thing to sit down and not know where to begin writing—what part to take for the purpose of a paper, whether the manufacturing, the distribution, or the machinery side, or the way in which the works were laid out. His idea was not exactly a question of the paper being a description of what they had seen, but rather that it should consist of something members had seen which had particularly impressed them from an educational point of view. The prizes had been won by Mr. J. Brown, Assistant Fittings Inspector, Manchester, and Mr. H. Dumbleton, Assistant Chemist at Rochdale Road Gas-Works.

OFFER OF MORE PRIZES.

The PRESIDENT said the Association were deeply indebted to Mr. Tagg for his kindness. As the members already knew, Mr. Thorp had very kindly offered to extend the prize scheme for next session; and he (the President) had also had an offer from Mr. Hollingworth of a prize of anything up to three guineas to be devoted to the most laudable object they could conceive.

THANKS TO THE VISITORS.

Mr. J. BRIDGE (Stretford) proposed a cordial vote of thanks to the visitors.

Mr. J. W. MORRISON (Sheffield) responded, as also did Mr. LAMB, the Resident Engineer of the Stuart Street electricity station of the Manchester Corporation.

Mr. HAYNES (Liverpool) proposed the toast of "Kindred Associations," and it was very cordially accepted.

PRACTICAL NOTES ON THE RUNNING OF GAS-ENGINES AND GAS-PRODUCERS.

At the invitation of the Council of the Junior Institution of Engineers, Mr. W. A. Tookey, M.I.Mech.E., undertook to present a paper to the North-Western Section of that body. The invitation was afterwards extended to apply to the entire membership by the presentation of the paper at one of the monthly gatherings. It was accordingly submitted at the meeting held in London on Monday, the 16th ult., and in Manchester the following Friday. It will be remembered that some weeks ago Mr. Tookey read before the Institution of Mechanical Engineers a paper entitled "Commercial Tests of Internal-Combustion Engines" [see Vol. CXXV., p. 158]. So as to avoid going over ground which he had previously traversed, he decided to present to the Junior Engineers a few notes on the running of gas-engines and gas-producers, and endeavour to give them some information from a recital of his personal experiences. Mr. Tookey has now become an authority on the subjects embraced in the title of his paper, some extracts from which are given below.

Reliability of the Gas-Engine.

It is only natural, perhaps, that one of the impressions that may be left in the minds of those reading this paper will be that the gas-engine is prone to a number of various ills, and that for this reason it might be deemed to compare unfavourably with other forms of prime movers. The author, therefore, would emphasize at the outset that just as the human body may be considered a thing of frailty if one is unduly influenced by the perusal of a medical reference-book, while actually the majority of people living manage to evade all but a few minor ailments during their long life, so the gas-engine, with but slight attention to a few simple details on the part of those in whose care it is placed, evades most of the possible troubles that might result in unsatisfactory working and breakdown. That this is so in fact was well brought out in a paper recently presented to the Manchester Association of Engineers by Mr. Hiller, the Chief Engineer to the National Boiler and General Insurance Company, of Manchester. In it he gave it as his experience that the reliability of different forms of prime movers can be tabulated as follows; N indicating the number of breakdowns, R the number of breakdowns *plus* the cost of repairs per breakdown—steam-engines being taken as 1:

Type of Prime Mover.	N.		R.
Steam-turbines	3·36	..	6·3
Gas-engines up to 14-inch cylinders .	0·60	..	0·24
Gas-engines, 15 to 24 inch cylinders .	2·82	..	3·01
Diesel engines	3·00	..	3·75

The above statistics are derived from the experience of the Company. "They are, of course, not permanent figures. The reliability of different types may be altered and improved by changes in the character of maintenance, by increased care in driving, by improved construction, material, or design. Any type, therefore, may progress from a low degree of reliability to a high degree, as indeed has been the experience in the past. . . . The figures relating to steam-engines and gas-engines generally refer to comparatively large numbers. Steam-turbine and Diesel engine figures refer to quite small numbers." The immediately preceding remarks have been extracted from Mr. Hiller's paper; and it will be seen that the table he has prepared proves beyond question the fact that in the smaller sizes of gas-engines there is little cause for the apprehension of trouble in actual operation from a "breakdown" point of view. The figures are not so satisfactory for the larger gas-engines. The reason for this is, in the author's opinion, that more skill in driving is needed—as, indeed, is mentioned by Mr. Hiller; and, for this skill to be forthcoming, it is absolutely necessary for drivers generally to be better educated in the management of these engines, and to be led to appreciate the particular points to which attention should be carefully directed.

It is only by a frank discussion of troubles that have been found to occur in connection with gas-engines, and the explanation of steps taken to overcome difficulties that have cropped up, that the necessary instruction can be given. The author has therefore considered it advisable to confine his attention to some of the more usual defects prevalent in gas-engine operation that have come under his notice. It should be pointed out that, in contradistinction to Mr. Hiller's experience as before detailed, the author has not been so much concerned with "breakdowns" as with complaints of irregularities in operation; but as one usually leads to the other, if through ignorance or neglect the cause of irregularity is not removed, the two points of view can readily be bought into focus.

Complaints and their Treatment.

A usual complaint in connection with gas-engines supplied with town gas is that an engine is alleged to work unsatisfactorily on account of "dirty gas," "bad gas," or "lack of pressure." Those responsible for making such allegations seem to be entirely unaware of the obligations of gas companies to distribute gas of standard quality and purity, and of the continual observations taken by officials of various public authorities to prove that the standard is strictly adhered to by the gas companies. But even accepting, for the sake of argument, that wide variations in gas quality, for example, can and do occur from day to day, it is difficult to account for any reasonable complaint on this score, when it is remembered that the same engine can as readily deal with town gas of (say) 500 B.Th.U. per cubic foot as with producer gas of only 130 B.Th.U. per cubic foot.

As with quality of gas, so with pressure. One and the same gas-engine can work as comfortably with town gas at a pressure of (say) 3 inches above atmospheric, as with suction producer gas with 8 or 9 inches of water pressure below atmospheric. For these wide variations the attendant, with experience of both gases, knows that in the one case he has to adjust his gas-cock to be partially opened, and the air regulator wide open, while in the other he has to put the gas-regulator wide open and have the air-baffle partially closed. By means of indicator diagrams, these adjustments can be readily effected and correlated; and, even when no indicator is available, it is quite a simple matter to obtain proper mixture proportions and efficient working.

When investigating complaints on behalf of gas companies, the author has found that irregular running of gas-engines on town gas may be partly, if not mainly, due to the gradual increase of "clearances" between valve-gear rollers and cams, or blockage of exhaust connections. In one instance, it was reported that for some time past an engine had been gradually getting less and less powerful, until the force of the impulses was barely sufficient to rotate the engine without load. The engine was a small one, and therefore had little margin for loss of power through abnormal increase of either mechanical or fluid friction. Indicator diagrams taken showed that the exhaust back-pressure line was extremely high; and upon disconnecting the exhaust-pipe at the outlet of the "silencer," it was found that there was at that point a crust of burnt oil forming a cake which almost completely blocked the outlet. When this was removed the engine ran in a manner in every way satisfactory, and took the full load of the shop with a considerable margin in hand.

Engines in residential neighbourhoods have to be fitted with special devices to lessen the noise of the exhaust emission; and in many instances a series of exhaust boxes have been provided for this purpose. In one factory in London, the author found that for this purpose as many as five boxes were used, arranged with double bends and straight connections alternately. The boxes were placed within a few feet of the exhaust outlet from the cylinder, and so restricted the flow of gases to the atmosphere that several horse power was required to force them through the silencers and a long vertical pipe to the roof of the building. The engine in question was required to operate at about its full power to deal with the ever-increasing number of machines installed in the factory; and it was resolved, on the author's suggestion, to rearrange the exhaust-pipe by removing the series of boxes to the roof, leaving only the long, vertical pipe to connect these with the engine cylinder. This had the desired effect. The resistance to the flow of exhaust gases was very considerably reduced, and the engine ran more satisfactorily with a greater load than before.

Another common defect of gas-engine operation is due to the attendant failing to check over the valve-settings from time to time, and more especially after "overhauling." Apart from loss of power due to improper regulation of ignition devices, about which something will be said later, it may be safely alleged that diminution of power developed by a gas-engine is frequently consequent upon irregular valve-settings. In many cases the set-screw forming the point of contact between the valve-lever and the exhaust-valve spindle either receives no attention at all or receives too much. If the former, the gradual wear that takes place involves contact later and "coming away" earlier; and consequently the exhaust valve is lifted from its seat later in the stroke, and comes again to its seat before the correct time. This diminishes the duration of the valve opening, and has a tendency to unduly bottle-up exhaust gases within the cylinder—thus involving not only the heating-up of the fresh charge, but reducing the density of the latter, and therefore reacting upon the power of the engine. To maintain proper results, the attendant should assure himself from time to time that the contact between the exhaust-valve lever roller and its cam, or between the set-screw and the end of the valve-spindle, just "comes away" after the inner dead-centre has been passed by the connecting-rod.

Timing of Ignition.

Too much importance cannot be given to the timing of ignition in all types of gas-engines. During the last ten years the author has been called upon to make tests of more than 1000 gas-engines of all sizes and types in all stages of repair and disrepair; and his experience with this large number of engines enables him to state with emphasis that the proper timing of ignition is one of the most important details of gas-engine operation. He has found

that a number of engines operate under conditions verging upon what is known as pre-ignition, mainly through the lack of any adequate means being provided whereby the attendant can adjust the time of firing to suit the particular strength of mixture with which the engine is required to work to develop its proper output of power. The timing-valves of most tube-ignition devices are practically non-adjustable, and, in numerous instances, gas-engines are working unsatisfactorily when by a slight alteration to the timing device risk of breakdown, such as Mr. Hiller has recently referred to in the case of larger sizes of gas-engines, would be almost entirely avoided.

Compression Pressures and Thermal Efficiencies.

The rapidity of flame propagation throughout the mixture in gas-engine cylinders is greatly intensified by the temperature of the charges at the end of the compression stroke. Naturally the degree of compression for which the engine has been designed largely influences the temperature of the compressed charge; and occasionally questions are asked as to the most suitable compression pressure. It has been amply proved that engines with moderately high compression pressures give high thermal efficiencies—other things being equal. Mean pressures of the order of 90 to 95 lbs. per square inch can only be utilized in gas-engine cylinders when intermission of "cut-out" or idle strokes occur, for with these pressures the internal temperatures resulting from combustion of the charges are the practical maximum that experience has taught to be safe. As long as the maximum temperature does not exceed the limit imposed by the practical mean pressures already mentioned, the author's experience seems to indicate that compression pressures of 150 or 160 lbs. per square inch with town gas can be utilized, provided that adjustable electric ignition is fitted which gives facilities for the retardation of the spark when full loads are being carried. On the other hand, not much is gained in the usual conditions of operation by carrying the compression pressure beyond 100 or 120 lbs. per square inch. Under test conditions, the thermal efficiencies with 160 lbs. compression show to slight advantage; but it is so slight that it is doubtful whether the greater risk of the occurrence of higher cylinder temperatures is worth while. [The author gave a chart showing the actual efficiencies obtained from a number of engines of greatly varying outputs under test conditions, as reported by different authorities during the last thirty years. It was evident therefrom that the comparatively slightly higher efficiency obtained by increasing the compression pressure from 120 to 160 lbs. is almost negligible.] Experience has shown that a maximum compression pressure of from 120 to 150 lbs. per square inch accords with good practice.

Water Circulation through Cylinder Jackets.

Before passing to speak of other practical topics that present themselves in connection with the running of gas-engines, a word or two should be said upon the subject of water circulation through the cylinder jackets, as this is an important matter, and has an effect upon the ignition timing quite as much as the compression pressure to which allusion has already been made. There is an unduly large number of engines working which suffer from overheating of the cylinders through imperfect circulation of cooling water. In connection with some of these, inadequate provision has been made for the proper and automatic supply of "make-up" water for the one or more tanks provided by the makers with the engine. The consequence of this is that in quite a number of cases the level of the water in the storage-tanks has been found to be below the top of the flow-pipe which enters the top of the hot tank, whereas there should be always an inch or two of "cover."

It is very desirable either to filter the water drawn from rivers or streams before passing it through the cylinders of gas-engines in rural districts, or to force it through the jackets at such velocity that it has no time to stagnate in corners or "pockets," and thus no opportunity is given for the deposition of solid matters in suspension. In any case, it is advisable not to allow the temperature of the water to rise above 140° Fahr., for above this temperature some of the salts held in solution are thrown down, and excessive differences in temperature may occur locally, involving undue stresses which may result in a claim being made upon the insurance company, with a consequent increase in the number of bad marks scored against large gas-engines in the records of the particular company. That such a claim arising in such a manner cannot be truthfully put down as a "gas-engine failure," but rather a failure of efficient supervision of water circulation arrangements, matters not a jot to the compilers of the "doomsday book" kept by insurance companies' officials. In this book failures due to the repeated occurrence of undue stresses in crank-shafts and extremely high cylinder temperatures—both brought about by the incompetence of drivers, who, in some instances, are not mechanics—all go down as a fault of the engine. It is advisable to keep this fact well in mind. It no doubt explains why Mr. Hiller's figures for large gas-engine breakdowns show so badly as compared with those for smaller gas-engines, as it is with these larger engines that water-circulation difficulties are most likely to occur, owing to the fact that some alternative to the storage of a large volume of water has usually to be arranged for with engines of 15 to 24 inch diameter pistons.

Improvements in Design and Construction.

It will be evident to the members of the Institution that the author's remarks, as do those of Mr. Hiller, refer mainly to gas-engines of "the day before yesterday," so to speak; for, of the total number of engines in use at any time, the large majority must naturally be of considerable age. During the last ten years some very remarkable improvements in gas-engine design and construction have been made. The coming of the suction-gas producer in the years 1902 to 1905 has since resulted in a rapid development of the larger sizes of gas-engines; and as time goes on, the records of the gas-engine industry show that the average size of engine sold is always on the increase. In times gone by, and almost within the present generation, it was thought that the largest practicable gas-engine would be in the neighbourhood of 30 or 40 B.H.P. per cylinder. Last year the author was called upon to inspect, for one installation, four gas-engines of 2400 H.P. each (600 H.P. on each side of the piston of two double-acting cylinders); and units of still larger output have been built, both in Germany and the United States of America.

It is well known that, with engines of these large outputs, some difficulty was experienced in the early stages in connection with the failure of castings, both of cylinder and piston; but to-day it is rarely found that these troubles appear. This result has been brought about by improvements in design, but also, and in great part, by the lessons learned from experience in the every-day working by the engineers in whose charge the engines have been placed. That greater reliability of the larger gas-engines (using the term in Mr. Hiller's sense—viz., from 15 to 24 inch cylinder) may be expected as a result of the continued extension of education upon gas-engine principles, is undoubted.

Gas-Engines *v.* Electric Motors.

The author is frequently asked for information as to the gas consumption of engines at full, half, and three-quarter loads, and particularly in connection with the generation of electric current. As a rough guide, it can be said that, whatever be the calorific value of the gas used, the gas-engine of to-day can safely be relied upon to develop one B.H.P.-hour for every 10,000 B.Th.U. in the fuel under full-load conditions. As a matter of fact, the performances of engines when in good order and properly adjusted prove that one B.H.P.-hour can be obtained for about 8250 B.Th.U.—equivalent to a thermal efficiency of 31 per cent., but dependent on the clearance volume ratio. In actual work, the full load outputs can be taken as obtainable with the mean of these two figures—say, 9000 B.Th.U. per B.H.P.-hour.

The actual gas consumption for any load other than full can be readily computed by assuming that the mechanical efficiency of the engine amounts to 85 per cent. at full load, and by deducting the horse power this represents from the indicated horse power developed at any point of the load range. For example, take the case of an engine capable of developing 100 B.H.P. at full load. At 85 per cent. mechanical efficiency, the indicated horse power would be 118, in round figures; and the frictional horse power would be the difference between these, or 18 H.P. At three-quarter load, therefore, 75 B.H.P. would be equivalent to $75 + 18 = 93$ indicated horse power; and as 9000 B.Th.U. per B.H.P. would be equivalent to $9000 \times 100 \div 118 = 7650$ B.Th.U. per indicated horse power, so the consumption of gas at 75 B.H.P. would be $7650 \times 93 \div 75 = 9500$ B.Th.U. At other outputs, estimated consumptions can be calculated in a similar manner, as, for practical purposes, it can be accepted as a fact that frictional horse power would be much the same at all loads; and given proper adjustment of mixture, regulation, and ignition timing, the consumption per indicated horse power would be practically constant, except perhaps at the lightest loads.

For gas-engine and producer-gas installations, test results have proved that one brake-horse-power can be obtained for one hour with a consumption of 0·75 lb. of anthracite when every detail is working at its best and the engine is fully loaded, and therefore at its highest mechanical efficiency. In practice, and for estimating purposes, it is usually considered that the round figure of 1 lb. of anthracite per B.H.P.-hour gives a sufficiently close approximation to the every-day conditions, with (say) two-thirds full load and with fuel of average quality and ash content. Records of performances of many engines and producers driving dynamos demonstrate that the overall fuel consumption under ordinary factory conditions, and including all stand-by and other losses, runs out at about 1½ lbs. of anthracite of average quality per B.H.P.-hour, or 2 lbs. per KW.-hour, and with bituminous coal 3 lbs. per KW.-hour.

Town-gas engines, with a fair load in proportion to rated full-load output, consume about 14,500 B.Th.U. per KW.-hour. If gas of 500 B.Th.U. per cubic foot is available at (say) 20d. per 1000 cubic feet, one unit of electricity—one KW.-hour—can be generated for 0·6d., of course for fuel cost only. Comparing a gas-engine consuming 20 cubic feet of 500 B.Th.U. gas per B.H.P.-hour with the cost of running an electric motor on fuel cost alone, and assuming an efficiency of the motor of 90 per cent., gas at 20d. per 1000 cubic feet would require the cost of current to be 0·48d. per unit for equivalent cost. In other words, it could be stated that a gas-engine with town gas of 500 B.Th.U. per cubic foot, at 20d. per 1000 cubic feet, could be permitted to run at such a light load with considerably diminished mechanical efficiency, or under normal load could be permitted to deteriorate into such a state of disrepair, that the rate of gas consumption could rise to 40 cubic feet per B.H.P.-hour before it would be equivalent, in fuel cost only, to the cost of electric current at 1d. per unit. Naturally, the relative advantages of gas-engines and electric motors cannot be summed up in a few words; but these comparative figures will be

interesting to members concerned either in the gas or the electric industries.

Operating Gas-Producing Plants.

It has been suggested to the author that some practical notes upon the running of gas-producers should also be included in his paper. In the year 1906 he read a paper before the Institution on "Recent Developments in the Construction of Suction-Gas Producers," in which, after reference to the early history of these plants, he gave diagrams illustrating the peculiar characteristics of many of the apparatus then on the market. During the eight years that have since elapsed, many new types of gas-generators have been brought out, with the result that suction-gas producers can now be obtained capable of utilizing all kinds of combustible material, even when placed in the hands of natives in all parts of the world. This fact alone should suffice to emphasize the simplicity of the series of operations that are required to be within the knowledge of those in whose charge suction-gas plants are placed, and also to explain the reason for such universal adoption, since they were first commercially introduced, little more than thirteen years ago.

The production of producer gas, being of the nature of a chemical process, depends for its efficiency and its continuity upon the maintenance of uniform conditions, which, from the circumstances of every-day operation, cannot be guaranteed. It is therefore to be expected that from time to time the calorific value of the gas produced must vary somewhat considerably, and particularly when sudden changes of load occur, and before and after charging, poking, or clearing the fires. According to the average output of gas from the producer to supply the engine in relation to the output for which it has been nominally rated, so the amount of attention needed is more or less; but generally it may be said that charging, clearing, and poking should be performed at regular intervals as circumstances demand, so that the conditions which are requisite for the highest efficiency of the chemical process shall be maintained as uniformly as possible.

There are two methods by which the attendant can be informed as to the maintenance or otherwise of the essential conditions which should prevail for the continuity of the production of good quality gas from suction-gas plants. One is by observing the pressure differences that exist at various portions of the apparatus, and, in the case of irregularities thus to be detected, taking such steps as will maintain uniformity of pressure differences throughout as experience dictates. The other is to pass some of the gas, under pressure, through a recording calorimeter, and thus obtain visible indications of the variations of quality that take place under different working conditions. To do this, however, involves the use of a fan, which has to be power driven—a matter of some consideration in many factories. If circumstances will allow it, there is no doubt that the installation of a recording calorimeter is well worth while. In its absence, however, the observations to be made from a series of water-pressure gauges are of practical value, for by such means any undue restriction in any part of the plant can be readily detected, and proper remedies applied.

There is one other point of practical importance that calls for special mention, and that is in connection with the supply of water to the vapour chamber, intended to humidify the air before the latter enters the fuel bed. In this respect the attendant again has very little concern except to take such steps as will ensure that the amount of water entering, when once adjusted, shall not vary whatever be the load upon the engine, and to be careful that final adjustments to the water regulator are made only after the producer has attained its normal working temperature, which it will do soon after the engine has been set to work under load. All that is necessary, in this connection, is to see that as much water as will evaporate is permitted to enter the vaporizer, of whatever type the latter may be; and this is easily proved by ensuring that some of the water escapes as such from the overflow-pipe of the vaporizer in a constant succession of drops. There is no need to try to adjust the amount of water entering the vaporizer according to the load under which the engine may from time to time be working. The quantity of air entering the generator is decided by the number of impulses taken by the engine, or rather by the amount of gas required by the engine to deal with its load; and it is merely necessary for the air to be saturated with water vapour at its normal working temperature of admission to the furnace.

It is clearly impossible, within the limits of a paper such as this, to attempt to cover all the many matters that a contemplation of the practical working of gas-engines and of gas-producers suggests as being likely to serve the present needs of the members of the Junior Institution of Engineers, whose interests are so diverse, and whose points of view are so varied.

North British Association of Gas Managers.—At the meeting of the Council of the Association held last week in Glasgow, it was arranged that the annual meeting will be held at Perth on Thursday and Friday, Sept. 3 and 4.

Scottish Junior Gas Association (Western District).—The annual general meeting will be held in the Royal Technical College, Glasgow, next Saturday. At the conclusion of the formal business, Dr. W. B. Davidson, of Birmingham, will deliver a lecture on "Tar and Liquor." In the evening there will be the annual dinner.

DOMESTIC LIGHTING, HEATING, AND COOKING.

Problems Considered from the Women's Point of View—The Remodelling of the Basement House.

At the Meeting of the Institute of Sanitary Engineers last Wednesday, a paper was read by Mrs. M. A. Cloudesley Brereton, entitled "Problems of Domestic Lighting, Heating, and Cooking, from the Women's Point of View," with special reference to the basement house. Mr. Arthur J. Martin (Past-President) occupied the chair.

The Chairman, in opening the proceedings, said there was no more capable housekeeper in London than Mrs. Cloudesley Brereton, who had given to the science of the subject a study which few women had done.

Mrs. Brereton explained that the general title of her paper was such a wide one that they had thought fit to narrow it down to the special consideration of one type of house which at the present time is, to a very serious extent, a glut on the estate market—viz., the basement house. The reason of this limitation of her subject was that the original invitation given to her to address the members was extended as the outcome of the paper she read at the Conference on the Economics of the Home at the National Gas Exhibition last October; her subject then being "Domestic Service as a Career for Educated Women."* In the course of that paper she said that, though home-making was work worthy of the very best brains, one of the insuperable obstacles to getting really well-educated women to undertake domestic work as a wage-earning career was the faulty architecture of many of our early Victorian town houses, with their steep stairs, stupid and meaningless corners and cornices, their lack of some of the very elements of sanitary schemes both upstairs and downstairs, because in these housework could not be properly done without wicked waste of precious human health and energy. But chief of all these structural drawbacks Mrs. Brereton placed the dark, dismal, and often inconvenient and unsanitary, basements, where the best-intentioned person who had ever before worked as an ordinary free woman in her own home, or that of anyone else with plentiful daylight, sunlight, fresh air, and an occasional glimpse of sky and of field or garden, could hardly be expected to be contented, or to keep well in either body or mind.

Improvement of the Basement House.

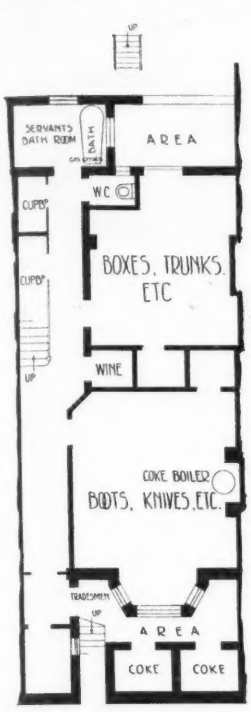
Coming to the subject of her paper, Mrs. Brereton said that public opinion during the last ten or fifteen years had revolted against the basement house; and modern sanitary science declared that it must be ended or mended—that the basement as a living place must be abolished or remodelled. The problem must be considered from the point of view of (1) the householder, more especially the mistress of the house and her servants; (2) the sanitarian, including sanitary engineers, architects, builders, &c.; (3) the property owner, including his advisers and men of business, land agents, house agents, architects, &c.; (4) the legislator, whose interest is especially needed in the case of the houses which are rapidly becoming unwholesome tenement houses, and as such fit neither for the occupation in the future of respectable single families nor of the one or two roomed tenants huddled together, who are the happy hunting-ground of the "house farmer."

Having shown that the reform of basement property is a paying proposition, Mrs. Brereton passed on to consider the future status of the domestic worker; and she expressed the opinion that if a better type of servant is to be looked for in the immediate future, old-fashioned methods of warming, cooking, and water-heating will have to be superseded. The gas-fire, gas-cooker, and gas water-heater would, she was sure, play a very important part in the solution of the architectural difficulty connected with the building of new and the re-modelling of old houses, lifts would save stairs, hot water would be available on every floor, and the distance between the rooms where the meals are cooked and where they are served would be reduced to a minimum, and awkward and dangerous steps and dark corners avoided. In Mrs. Brereton's opinion, the only way to do without the "lower regions"—or should she say the "infernal regions?"—is to abolish smoky fuel altogether, and in many cases to get rid of all solid fuel, including even coke, which, however, might be retained under certain conditions in some remodelled houses. She would, in short, put in gas for lighting, warming, cooking, and water heating. Some architects and housing engineers might, of course, prefer to put in other forms of lighting for decorative purposes in conjunction with gas lighting for ventilating and the bulk of the economical lighting. Speaking generally, she believed that, in the servantless and one-servant house, the basement as a living-place could be entirely abolished, with many advantages and no disadvantages to either landlord or tenant.

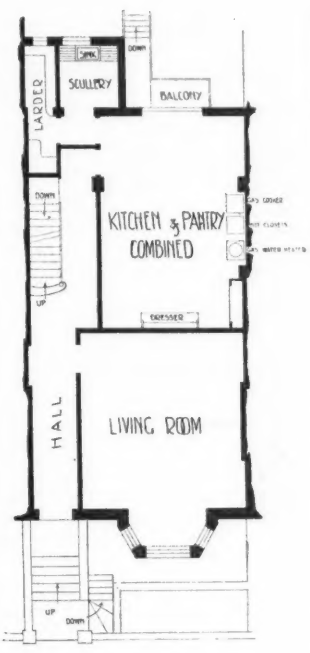
How Improvement Can be Effected.

Mrs. Brereton gave some typical examples of basement houses, and showed how this class of property could be brought up to date. She said it might, for convenience, be divided into seven main types: (1) The lowest type in slums. (2) Clerk's or mechanic-workmen's houses, in towns or suburbs—say, £30 to £60 rent, taxes, &c., inclusive. (3) House of the rising young professional or business man; rent £60 to about £150. Basement capable of being wholly or partially retained, but remodelled. (4) Same type where basement must be abolished. (5) Medium

* See "Journal," Vol. CXXIV., p. 547.

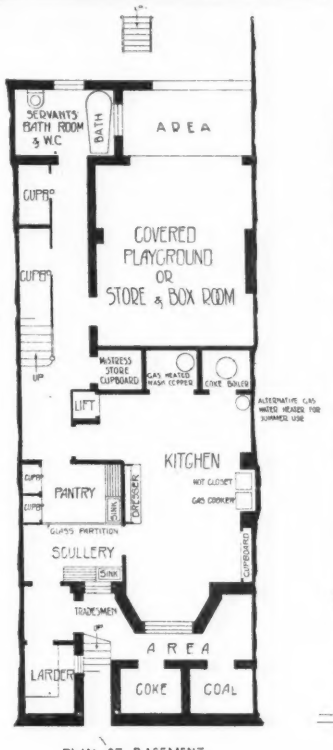


PLAN OF BASEMENT

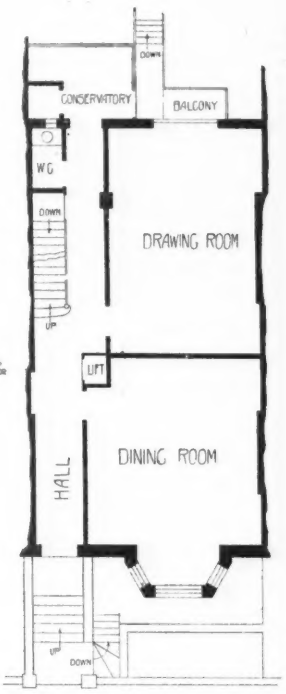


PLAN OF GROUND FLOOR

House in Holland Park District, Showing Basement now Abolished.



PLAN OF BASEMENT



PLAN OF GROUND FLOOR

House in Holland Park District, Showing Modified Arrangement.

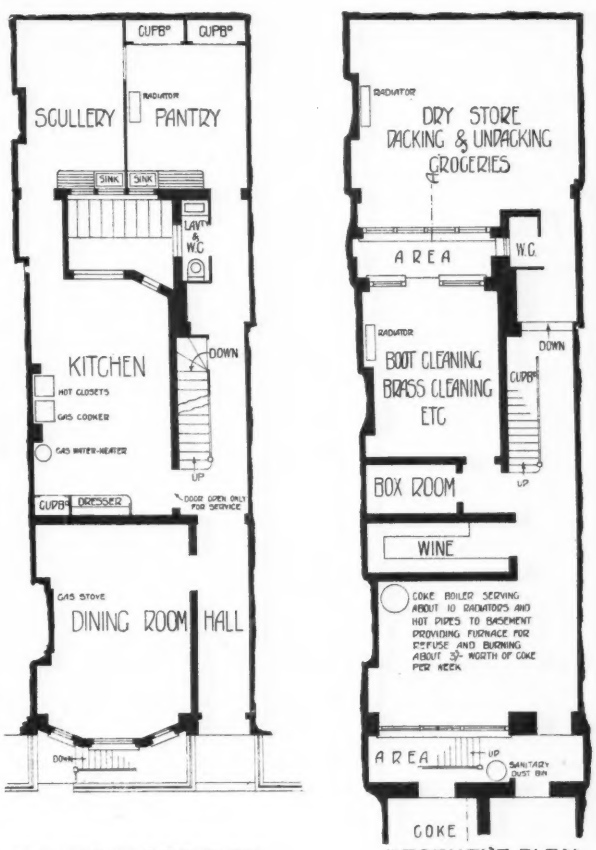
town house; rent from £150 to £250. (6) Large suburban house, detached or semi-detached—basement or semi-basement; rent £100 to £250. (7) Large town house; rent £250 upwards. All these types must, she said, be considered from the point of view (*a*) of the housewife, (*b*) of the sanitarian, and (*c*) of the property owner. The first and last type of house (Nos. 1 and 7) were outside the scope of the paper. The large town house, with its big group of offices in the basement, must be remodelled and the basement retained. There might, however, come a day when, in some cases, these offices would be turned into cellars, and the kitchens rebuilt in the regions of the roof; but this was possible only when a lift could be installed from cellar to attic. Mrs. Brereton expressed her indebtedness to Mr. E. C. P. Monson and his brother, the Architects to the Sutton Trust, as well as to their staff, for assistance in surveying and making accurate plans of these typical houses; and the results of their labours were exhibited in drawings showing how the houses originally stood and the way in which they had been adapted, or how it was proposed to adapt them. Mrs. Brereton offered the following explanatory remarks upon them:

Where basements are abolished, the main principle has been to bring the kitchen up level with the dining-room, and to substitute throughout the house gas-fires for coal-fires, and gas water-heaters of one of the four usual types (storage boilers, circulating boilers, geysers, or califonts). In certain cases—the majority of cases—I have suggested the installation of a coke-boiler either in the disused cellars or in the kitchen, to heat the domestic water system of the house as well as to heat the kitchen or keep the cellars dry and wholesome. These coke boilers may be divided as to their functions under two heads: (*a*) In

NOTE.
GAS FIRES THROUGHOUT. NO COAL.
GAS VENTILATING LAMP IN KITCHEN.
COKE BOILER FOR RADIATORS & DOMESTIC SUPPLY.
GEYSER FOR BATH & SERVANTS USE IN WARM MONTHS WHEN COKE BOILER NOT IN USE.
COMBINATION OF ELECTRIC LIGHT & GAS WITH DISTANCE LIGHTER.

BASEMENT PLAN GROUND FLOOR PLAN

House in Vale Avenue, Chelsea.



GROUND FLOOR PLAN. BASEMENT PLAN.

House in Welbeck Street.

the smaller house, for economy's sake, they have been indicated on the plans as built in the kitchen to warm it, warm the domestic water supply (baths, &c.), and also supply waste heat to at least one radiator to take the chill off hall and landings, making it thereby possible to be extremely economical with the gas-fires throughout the house; (*b*) in large houses, gas water-heaters have, as a rule, been suggested for the domestic hot water supply, with coke-boilers (or, in exceptional cases, gas-furnaces) for the radiators only. These radiators, which are, of course, in accordance with the most modern scientific ideas, "low-temperature" radiators, governable by means of thermometers, have been placed under the windows in large rooms, in halls, staircases, and servants' quarters, so that the house in question may be kept always dry and moderately warm, and the gas-fires used only as intermittent heat to provide radiant heat when the respective rooms were actually in use—for example, in the dining-room before and during meals, in the drawing-room for a few hours daily or weekly, in the library and billiard-room when in use, in the bedrooms to dress and undress by, or continuously in cases of sickness, as may be from time to time required by domestic circumstances, and by our varying atmospheric temperature.

Solution of the Terrace House Problem.

On the subject of terrace houses, where there is no side entrance for tradesmen, Mrs. Brereton said these presented to her at first the greatest difficulty, from the surveyor's point of view, if the basement were abolished; but she eventually found a way out of it which is shown on one of the plans. She was afterwards encouraged to believe that this was not only a good, but an extremely practical, solution, as some of the newest and most successful small town houses—for example, those in Vale Avenue, Chelsea—have been not remodelled, but newly built, on practically the same plan as that which she had outlined. (The architects were Messrs. Elms and Jupp.) By the kindness of a lady friend, Mrs. Brereton was able to show the plan of one of these houses which is managed by the lady, who entertains a great deal, with two maids, and does absolutely no work herself. Referring to this plan, Mrs. Brereton said:

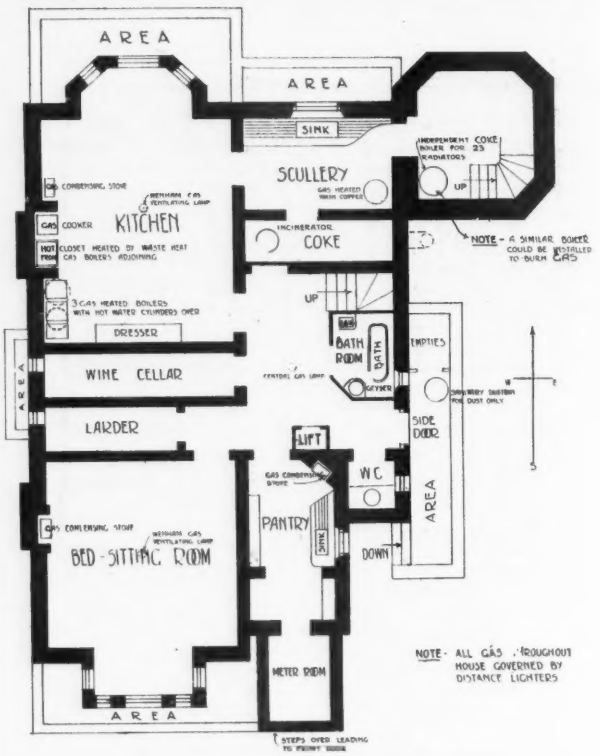
The great difficulty which I referred to was how to admit tradesmen and others in a terrace house if the area was dispensed with. The objection to using the front door (then on a level with the proposed kitchen) for all purposes is obvious. The old-fashioned type of area was an eyesore. In these new houses the area steps are retained, but are substantial and well built. The area entrance is used only to bring in groceries and other goods and to take away empties, &c., and also as the servants' entrance to the house. There is no window from the cellar to the area, much to the improvement of the appearance of the front of the house. What the servants lose in having to answer the door once or twice a day to tradesmen they much more than gain in being on the same floor as the front door for answering visitors' bells, and on the same floor as the dining-room for waiting table. One of the cellar rooms is used for a wine cellar, and the other as a storeroom for any groceries, &c., bought in bulk, empties to be returned, and so on. There is no solid fuel in the house. There are gas-fires in every room. A small coke-boiler has been installed in the kitchen, which is next to the dining-room. This supplies the bath water and water to the washing-up sinks and a fixed washstand in the dressing-room, as well as to several radiators. There is a supplementary gas water-heater in the bathroom for any emergency, such as after summer holidays, when the coke-boiler might be unneccessary, and another small one for the same purpose for the kitchen sink. There is a combination of electric lighting and gas lighting.

Mrs. Brereton said she had described this model house in some detail, because it was the scheme on which she would remodel the large proportion of medium town houses. Each house would have to be taken on its individual merits, for each presented different drainage and other difficulties. But the principle, once accepted, of adapting or abolishing the basement, she knew there was no such word as "can't" in a modern engineer's vocabulary.

The Authoress's House Remodelled.

Coming to the large suburban house, detached or semi-detached, Mrs. Brereton said it was a distinct problem from the terrace house, and a much more easy proposition from the remodelling standpoint. In such detached houses the separate entrance from the garden or the side, or both, removed the difficulty of the area, if there was an area to begin with, which there very frequently was not. The basement was frequently only a semi-basement, and could, with very little adaptation, be made fairly light, airy, and comfortable. She showed drawings of her own house as it was a year ago, before she took it, and as it is now, after having been remodelled in accordance with her views, with the co-operation of an architect and a gas engineer. We give a reproduction of the drawing showing the basement as at present arranged. Explaining the nature of the changes made, Mrs. Brereton said:

There is no solid fuel except for the coke-boiler in the winter months to heat the radiators, and that, of course, could be, and may be, heated by means of a gas-furnace, if I find I can later on, when all the children go away to school, dispense with yet another servant. Gas, of course, for continuous use, is dearer than coke; but a very large coke-furnace is somewhat heavy work for a woman, and I have no man servant. The "servants' hall" has been adapted for a bed-sitting room for three servants. There has been built a bath-dressing room, with hot and cold water to supply a fixed washstand (served by a geyser for use in the summer months). The coal-range was removed, and a gas-cooker, gas water-heater, and gas condensing-stove to warm the kitchen were fixed. The pantry had a gas condensing-stove fixed in place of a coal-fire used by the former tenant; a similar stove was fixed for the servants' bed-sitting room, a smaller gas-cooker was fixed in the scullery for occasional use (as, for instance, in the holidays,



No. 7, Lyndhurst Road, Hampstead, as Altered.

when servants were in the house alone); a gas-heated wash copper is fitted in the scullery; and a gas-heated incinerator for burning refuse in the large coke cellar, for use when the coke-furnace is not in use. A service lift was fixed from basement to hall, as the kitchen stairs, though well lighted, are steep, and the carrying of trays was said by the former tenant to be a great difficulty in the way of keeping a parlourmaid. The basement is lighted (as is the rest of the house) throughout by gas; ventilating lamps being used for the most part, because the ceilings are not very lofty, and, further, because a really good light is essential to cleanliness where cooking and washing-up are done. The result is entirely satisfactory, though the former tenant, with one-third the number in family, and with the same number of servants besides help from a man, found the house difficult from the labour point of view with coal-fires, coal cooking range, and no lift. There are dozens of such houses only waiting for a combination of modern engineering, modern business method, and modern imagination to bring them into favour again.

How the Gas Companies will Help.

The author added that she ought perhaps to mention that the larger gas suppliers themselves are willing to take in hand engineering work, and keep specially skilled men to advise on each house on its merits, and give estimates not only of capital cost but of running cost. Moreover, most gas undertakings would bear the capital cost and hire-out the apparatus to landlords or responsible tenants at a yearly rental, so arranged under a proper agreement as to recoup capital and interest. This arrangement was, she pointed out, largely patronized by tenants who do their own repairs and improvements; but it might also, she suggested, be a great boon to small landlords who would willingly try experiments, but could not afford heavy capital charges for a large number of houses on which they had been steadily losing money, perhaps for years, owing to their standing empty. Such a scheme might give their property a new lease of life.

In bringing her paper to a close, Mrs. Brereton said she had tried to indicate some broad principles and to describe some typical cases; and she trusted that, in the interests of individual and corporate health, her audience would use their influence to adapt or adopt some of the methods she had suggested.

DISCUSSION.

Mrs. Percy Boulnois said that in her opinion there was a great deal of bad air generated by gas-fires, and they did not give the same warmth as a coal-fire. Her experience was that gas-fires produced as much dirt as a coal-fire in the way of blackening the ceilings. She admitted, however, that the use of gas-fires obviated carrying coals and coke about the house.

Mr. Leon Gaster said he fully agreed that if there was one room in a house which ought to be well lighted it was the kitchen. In addition to improved methods of artificial illumination, there were also now some special forms of prismatic glass, the use of which assisted considerably in daylight illumination. He looked for good results from the work of the Departmental Committee on Factory Lighting generally; and no doubt some of them could be applied in the direction in which Mrs. Brereton was working.

Mr. Percy Boulnois also expressed the view that a coal-fire was preferable to any gas-stove. The former was, in his opinion,

more wholesome and more cheerful, and there was a sort of comradeship about it which appealed to his various tempers. He nursed it when in a good temper, and poked it vigorously when in a bad one; and that could not be done with a gas-fire. Again, a gas-fire could not be used for the disposal of refuse, as could a coal-fire.

Mr. A. S. E. Ackermann (Secretary of the Society of Engineers) said that three or four years ago nobody was more determined than he to have a chimney for every gas-stove. He found a difficulty, however, in fixing a chimney over the gas-cooker, and when he thought things over he came to the conclusion that pure carbon dioxide in a room was absolutely non-pathogenic, and could not do any harm. He got into communication with Dr. Leonard Hill, and as a result blocked up every one of his chimneys; and he now got all the gas fumes into the house. In the dining-room, where the gas-stove was used at times, a canary and a parrot thrived, while the plants also had not suffered. In the kitchen there was a gas-fire, and in the scullery a gas-cooker as well as a gas circulator, and in every case the chimney was blocked up. The cooker, of course, had no chimney at all, and it was interesting to remember that whereas years ago it was said that twenty parts of carbon dioxide per 10,000 was harmful, we were now being told that 4½ per cent. did not do any harm.

Mr. E. Denyer said he did not know whether Mrs. Brereton held a brief for the Gas Company, but certainly he should have thought Mr. Ackermann did. Gas used for heating and cooking was burnt in an atmospheric burner; but the most perfect combustion obtainable was, he believed, with the argand burner. He thought it would be found that atmospheric burners not only gave carbon dioxide, which was serious, but also a considerable quantity of carbon monoxide [cries of "No, no"], which was a poison; and from this point of view he seriously deprecated the closing-up of the flues. He personally liked to see a coal-fire, if only for the reason that, if it were necessary to have a fire for heating purposes, one might as well have something which not only could be looked at, but which could be used for purposes of ventilation as well. On the other hand, however, he almost regarded a fire as unnecessary, and considered that hot-water radiators could be used instead. [A Voice: No.] Again, he saw no use whatever for geysers in a bathroom in addition to hot-water apparatus heated from downstairs. He looked upon geysers as toys, and also as uneconomical, because the cost of water heated by coke, gas, and electricity was as ½d., 1½d.: 6d., assuming electricity at 1d. per unit; and therefore sufficient stress had not been laid upon the hot-water radiator. Though he knew it was fundamentally inaccurate, yet in small houses it was quite practicable to attach one or two radiators—say in the hall and on the staircases—to the domestic hot-water supply, if it were properly carried out.

Mr. F. W. Goodenough said he should much like to correct the statement made by Mr. Denyer with regard to the carbon monoxide from an atmospheric burner. He did not know where the speaker got his impression from; and perhaps he (Mr. Goodenough) might draw his attention to the Special Commission on Gaseous Heating appointed by the "Lancet," some twenty years ago, to investigate the hygienic aspect of the use of gas for heating. This Commission tested innumerable gas-fires of considerably inferior make to those now available, and came to the conclusion that they were not only unable to find any carbon monoxide given off from the gas-fires in the rooms, but they could not even find any trace of it at all in the flue gases sent up the chimneys. If, therefore, any was found nowadays, it was clear that the combustion was so seriously interfered with that it was hopelessly out of order; and this was a point which could be demonstrated in the laboratory at any time to any interested person. If gas flames were continually giving off carbon monoxide the majority of students in the South Kensington laboratories and elsewhere would be dead, because this was a dangerous deadly gas for breathing, and it would be given off, according to the last speaker, constantly into the faces of the students, which, of course, was absolutely and entirely wrong. Mr. Boulnois had referred to the advantage of the coal-fire as a comrade. It was quite true that there was a prejudice in its favour to the extent that one could knock out the ashes of one's pipe in it; but at the same time it was a comrade which had a habit of deserting one at rather critical moments. If one was sitting up late at night, and did not keep a careful watch on it, it would be suddenly found that the fire had gone out just at the time when the work one was engaged upon was not quite finished. Also it could not be relied upon in the sick-room, as it had a habit of going out in the small hours, just when vitality was at its lowest; and he had known of cases where children suffering from bronchitis had died through the fire going out as a consequence of the nurse dropping off to sleep. He took it that geysers were fitted in bathrooms for occasional use when the general hot-water system of a house was not in operation; and certainly they had a very useful application.

Mr. Ackermann remarked that the closing of the chimneys, to which he had referred, probably did not have any serious results because ventilation could be effected by opening the windows,

Mr. Goodenough said there was a danger of checking the ventilation in a room by doing away with the chimneys.

A Lady said she had used gas-fires for four years with great satisfaction, but had noticed that they created much more dust than coal-fires, or, at any rate, the amount of dusting necessary in the rooms where the gas-fires were was greater than in a room with a coal-fire.

Mr. Denyer, on the question of carbon monoxide being given off, said there had been several cases of asphyxiation in bathrooms where geysers had been fixed and no ventilation provided, and at more than one of the inquests carbonic oxide was found to have been in the room.

On the motion of the Chairman, a very hearty vote of thanks was accorded to Mrs. Brereton for her paper.

Mrs. Brereton, in reply, said she thought Professor Lewes, at the previous meeting of the Institute, had gone sufficiently into the hygiene of the subject to answer the points raised by Mr. Denyer. She did not hold a brief for any gas company, but had been forced into a very complete use of gas by the fact that she simply could not go on with her housekeeping without it. She at one time had seven coal-fires going all day, and her servants struck, with the result that she was left for three whole months with only a scullery maid of sixteen and a housemaid of seventeen in a big house, and with five children. In this way she was forced to take up gas-fires, though she had no objection to any other system of heating which did not involve solid fuel. When, however, she stated that she once had two electric fires, and received a bill for £24 16s. for one quarter's use, it would be seen why she preferred gas. As to geysers, they were extremely useful in the summer time, as Mr. Goodenough had pointed out. She could not agree with Mrs. Boulnois that anything like the same amount of dirt was present with gas-fires as with coal-fires; and in reply to the speaker who referred to the extra dust when using gas-fires, probably this was due to the greater ventilating effect of the fires, with which the "pull" was so enormous that better ventilation was produced. This could easily be proved by holding a wax taper or a match in front of a modern gas-fire; the flame was pulled right up the chimney. She disagreed with stopping up chimneys. This had proved to have been bad at the Old Bailey, where a room was built without chimneys; but the people employed in it very quickly suffered from bleeding at the nose. Windows could not possibly give the same ventilating effect as a chimney, at any rate, in the winter time, when it was not comfortable to have them open. As to the disposal of refuse, mentioned by Mr. Boulnois, there was a gas destructor on the market; and in her house she had one with which she destroyed all refuse twice a day, with the result that her dustbin only contained ashes.

MODERN METHODS OF WELDING.

By Thomas T. Heaton, of Uxbridge.

[Extracts from a Paper read before the Institution of Mechanical Engineers.]

The author said that the increasing interest being taken in this question led him to hope that a short practical survey of its present aspect would not be out of place; and he devoted himself more especially to those methods of which he had the most personal experience—drawn entirely from more than twenty years of work on a progressive commercial basis.

Broadly, the systems may be divided into two:—

(*A*) Electric welding, in which the heat required is produced by the electric current.

(*B*) Gas welding in which the heat is produced by gas or mixture of gases.

These divisions may be subdivided, as in both cases there are variations both in method and in means.

Passing over his details regarding the systems of electric welding now generally in use, we continue with the section of the paper in which the author deals with

Gas Welding.

He says: The heat is produced by a mixture of gas (of more or less good calorific value) with oxygen. The gas is led from its source of supply through a flexible pipe into a burner, held in the hand of the operator, and oxygen is also led into the same burner in a similar manner. The pressure of the gas and of the oxygen is regulated by suitable apparatus. The proportion of gas and oxygen is adjusted by inlet-valves on the burner; and means are provided to prevent back-firing. The gas and oxygen, issuing from the burner through a small orifice at the mouthpiece, are ignited; the proportions of the two being adjusted until a clear flame shows itself in a fine point. The work is heated by this flame at the welding point, and soft iron is melted into the joint to increase its thickness and therefore its strength.

With regard to the gas used for this class of welding, the author thinks the best is acetylene; but other gases are used in conjunction with oxygen—namely, benzol vapour, coal gas, and hydrogen; the last being used more especially on the Continent. But acetylene, oxygen, and coal gas can be used together. Acetylene and oxygen, however, form as good and effective a mixture as can be desired.

Of the various systems referred to, the author regards electric arc welding and oxy-acetylene welding as the two systems most suitable for general application, and the rest for special work. In some classes of work the electric arc is the more suitable; in others the oxy-acetylene system; while in some cases both systems are equally applicable. Each is more economical in its own sphere. Owing to the lower temperature, the oxy-acetylene flame is better

for thin work than the electric arc, because the risk of burning the metal is not so great. The temperature of the electric arc is calculated as about 7500° Fahr., but will vary with the amount of current; that of the oxy-acetylene flame is about 6000° Fahr.

In the author's opinion, the electric heat must be far more effective, however, because it is produced within the work itself, whereas the heat of the gas-flame is applied entirely from outside. Where the work is suitable for the electric arc, welds can be made far more quickly than by the oxy-acetylene flame. The proportions of the two gases in welding vary somewhat, but should be in the neighbourhood of 1·5 volumes of oxygen to 1 volume of acetylene. Both systems are used in the welding of mild-steel plates, steel barrels, and drums, steel tanks of all shapes and sizes, compressed-air receivers, steam-boilers, &c. The welds are capable of withstanding high pressures; indeed the author's firm have made welds in gas cylinders which have successfully withstood a pressure of 4000 lbs. per square inch, and welds in mild-steel tube $\frac{3}{16}$ inch thick by $1\frac{1}{4}$ inches diameter inside, which have withstood a hydraulic pressure of 6 tons on the square inch (equal to 20 tons on the metal).

The author has heard the argument advanced that, in electric or gas welding, the result depends on the individuality of the workman. To a certain extent this is true, as it is true of most mechanical operations. In a weld, however, there is this difference from some other kinds of work, that a defect is not always apparent. With proper training and adequate supervision, however, and a suitable test, there is no reason at all why full confidence should not be felt to a much greater extent in electric or gas welding than in blacksmith's welding. He proceeds to give examples, all of which go to show that these systems of welding are practical, reliable, and worthy of confidence in every respect. Naturally the character of the metal at the weld is changed to a certain extent. It loses some of its ductility, and some of its strength, but loses far less than does a blacksmith's weld. Many tests have shown that 89 to 96 per cent. of the original strength of metal can be relied on in the electric weld. It has been said, but quite wrongly, that the electric welding hardens the metal by filling it with carbon from the electrode. This is not the case. For example, in welding mild steel, the fierce heat of the electric arc burns out all the impurities, more or less, including carbon, and leaves the metal at the weld purer iron.

Tables of figures were given to show the effects of the welding upon the metal. For these analyses, drillings were obtained from the plates themselves, and also drillings from the welded joints. The plates were tested mechanically, both longitudinally and transversely along the welded joints, and for comparison the unwelded metal. The results of the mechanical tests of the unwelded metal are the mean of three sets.

TABLE I.—*Chemical and Mechanical Tests of Acetylene and Electrically Welded Plates.*

—	Electrically Welded.		Acetylene Welded.	
	Unwelded Metal.	Welded Joint.	Unwelded Metal.	Welded Joint.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Silicon	0·009	0·003	0·009	0 002
Carbon	0·150	Trace	0·150	Trace
Sulphur	0·025	0·020	0·085	0·071
Phosphorus	0·068	0·043	0·068	0·067
Manganese	0 640	0·270	0·490	0·340
Iron (by difference)	99·108	99·664	99·198	99·520
	100·000	100·000	100·000	100·000

TABLE II.—*Mechanical Tests on Mild Steel, $\frac{1}{8}$ Inch Thick.*

—	Electrically Welded.			Acetylene Welded.		
	Unwelded.	Welded Joint.		Unwelded.	Welded Joint.	
		Transverse.	Longitudinal.		Transverse.	Longitudinal.
Elastic limit, tons per sq. in.	15·20	17·60	*Nil*	11·76	11·60	*Nil*
Breaking weight, tons per sq. in.	26·66	24·00 = 90%	25·60 = 96%	23·14	18·24 = 78·80%	23·20 = 100·2%
Contraction of area, per cent.	47·25	*Nil*	*Nil*	46·66	49·60	*Nil*
Extension on 4 ins., per cent.	23·16	5·00	0·50	26·33	13·50	4·25
Extension on 2 ins., per cent.	30·33	7·00*	1·00†	33·66	22·00‡	8·00

* Broke in weld. † Broke outside gauge length. ‡ Broke clear of weld.

In order to show various applications of electric and acetylene welding, illustrations were given by the author in an appendix to his paper. One of these was a mild-steel water-jacketed exhaust pipe being welded by acetylene and oxygen. Three types of burner are shown in this illustration. One is a Fouché burner; and a second the type of burner recommended by the British Oxygen Company. For different thicknesses of work it is necessary with both these types to have different sizes of burners. The third burner shown is one made by a firm in Brussels. It is of copper tube and is flexible.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Board of Trade Returns and the Make of Gas per Ton.

SIR,—I happened to be going into the Board of Trade figures this week, and, finding that my calculation of the make of gas per ton of coal did not coincide with yours, I looked again into the matter, and found that, instead of the figure of 11,110 cubic feet which you gave in your leader of March 24, the correct figure is 11,733 cubic feet. You will see that this has an important bearing upon the remarks which you made; for, instead of having to explain-away a reduced make, there was, as a matter of fact, an increase of 161 cubic feet per ton.

Longwood, March 31, 1914. JNO. HY. BREARLEY.

[Our correspondent's correction is referred to in the editorial columns to-day, p. 14.—ED. J.G.L.]

Hereford Coke-Quenching Plant.

SIR,—In the excellent comments by "Modus Operandi," which I follow in each issue with interest, I note that this week [March 31] he touches upon the important question of moisture in coke, and draws attention to an arrangement for coke-quenching which was installed at the Hereford Gas-Works by Mr. William Parlby many years ago. The arrangement, I believe, is still in use to day.

The water-tank in this case is erected, in close proximity to the retort-house, upon four cast-iron columns, and fitted with a water ball-tap. The spray is fixed directly underneath the tank, and is of suitable size for the type of coke-barrows in use. When introducing this system, it will be found necessary to obtain a good head of water, if moisture in the bulk of the coke is to be kept low. The tank should be erected high; for if this precaution is not taken, the outer layer of coke will have a tendency to become "soaked with water," and the coke in the interior of the barrow will be insufficiently quenched.

It would be interesting to know the variation in percentage of water in the exposed layer and the interior of a barrow of coke when properly quenched in bulk. I refer to the deep type of coke-barrow or cage. Admirable as the system is found to be, my observations lead me to think that a portion of the coke, at all events, contains a somewhat high percentage of water.

Gas-Works, Droitwich, April 3, 1914. FREDERICK SHEWRING.

Low-Temperature Carbonization.

SIR,—May I have the use of your columns in order to join issue on one or two points which arise out of the article by "Amicus," on low-temperature carbonization, in this week's "JOURNAL"?

First, I take the statement of your contributor, "in order to produce any demand for it [semi-coke], it must be available at a price less than coal." I cannot see the grounds for such a statement. In an open grate, with raw coal giving 14,000 B.Th.U., the thermal losses will approximate to 80 per cent., leaving 20 per cent., or 2800 B.Th.U., to be radiated into the room as effective heat; the losses being due to heat used in decomposition and in unburnt matter escaping up the chimney. The B.Th.U. in a semi-coke will be less than those in the coal from which it is made, chiefly owing to increase of ash. Therefore, instead of 14,000 B.Th.U., about 13,000 B.Th.U. will be found in the semi coke. Owing to the losses from decomposition and escape of unburnt matter being eliminated, the effective radiated heat units will be 5200, or nearly twice as much as the coal from which the semi-coke was made. If, therefore, the amount of heat radiated per ton of fuel burnt (other things being equal) is to regulate the price of the raw coal and the semi-coke, then I submit that, if the former sells for 28s. per ton, the value of the latter is 52s. per ton.

Bearing these facts in mind, I cannot see the justice of assuming that semi-coke will sell for less than coal; and the probability is that it will sell for more. The supply will not overtake the demand, as your contributor suggests, until the use of coal in its raw state is a thing of the past. The great economies in using semi-coke will be obvious to every consumer, before he has burnt his first ton.

Your contributor says that, "if a smokeless fuel were manufactured privately, and became a serious competitor of gas coke, the gas companies might without very much difficulty put on the market a very similar product at 'cut' prices." Semi-coke, when it comes, will enter the lists primarily against raw coal; and I do not think that it will compete seriously with gas coke, if the gas companies will meet the competition by improving their coke. It is useless for a gas company to think of manufacturing a true semi-coke in the present form of apparatus, either horizontal or vertical, owing to the difficulty of maintaining an even temperature in the setting in the case of horizontals, and owing to the thickness of the charge in verticals. But the gas companies can use low-temperature apparatus for part of their make, and can also improve the coke by dropping the temperature to (say) 1600° Fahr. A fuel produced at such a temperature, with about 5 per cent. of volatile in it, would have many uses to which, on account of its slower burning capacity, it could be more usefully put than could semi-coke with 12 to 15 per cent. of volatile. Such a coke would have to be made from clean coal, as the lower the volatile the greater the necessity for having as little ash as possible.

This brings me to the point raised by "Amicus" of the increase in ash that is unavoidable in all coking processes. It is, I think, unfair to take a coal with 20 per cent. of ash, as this is much higher than the average coal, and to put the ash of the semi-coke at 30 per cent. Coal with an ash of 10 per cent., increasing to 15 per cent., would far more nearly represent the average run of coals. In this case there is, undoubtedly, a loss of 5 per cent.; but surely the point to take is the amount of heat radiated in spite of the increased ash. In my estimate above, I have made an allowance of 1000 out of 14,000 B.Th.U. for

loss under this heading; and yet I show that 5200 B.Th.U. are radiated as effective heat by the semi-coke, against 2800 B.Th.U. by the coal from which it is made when burned in the raw state.

I deplore, as much as "Amicus," the extravagant claims that have been made for some processes, wherein the parts are made to exceed the whole, and the difference that exists between working a small experimental plant and a large commercial one.

Your correspondent says that "the value of the gas per ton of coal to a gas engineer is in the neighbourhood of 25s." This statement is preceded by an estimate of the value at a colliery of the low-temperature gas as 2d. per 1000 cubic feet. Deducting 6d. from 25s., "Amicus" assumes that the semi-coke manufacturer has to make a good margin of 24s. 6d. out of the other residuals. Does not a fallacy lie here? What I take "Amicus" to mean is that the selling price of gas in London makes a return in gross revenue to the engineer of 25s. per ton. It is unfair to take this figure without reference to the revenue derived from other sources, and without making deductions for distribution, &c. If any comparison be instituted, it can only be done on the basis of profit made upon a given capital outlay for high and low-temperature carbonization respectively.

In conclusion, let me say that I appreciate the friendly tone of the observations of "Amicus," and that any criticism I have offered is made in the same spirit.

L. SLOANE RICHARDS.

101, *Leadenhall Street, E.C., April* 3, 1914.

Alternating versus Direct Current Distribution.

SIR,—Mr. Barker Johnson's remarks on alternating and direct current electrical systems (as reported in this week's "JOURNAL") would appear to require some qualification.

He states that, of breakdowns in D.C. machines, 95 per cent. are caused by commutator troubles. I should like to see this statement either verified or corrected. One of the leading Insurance companies, in tabulating D.C. machinery breakdown figures for 1908, 1909, and 1910, give the percentage due to commutator trouble for these years at 29, 31, and 29 respectively. These figures, of course, only apply to machines insured by this particular company; but they seem nearer the mark than 90 per cent. As a matter of fact, a well-made commutator should give very little trouble indeed, provided it receives intelligent supervision. The advent of commutating poles has largely eliminated sparking; and most other inherent troubles have vanished with improved design.

The special difficulties experienced when working at high speeds are not very likely to affect the gas engineer. It goes without saying, of course, that to buy shoddy electrical goods, or to put plant in the hands of unqualified workmen, is to ask for trouble. Having put in a good word for the commutator, I am quite ready to admit that slip rings are simpler. But to describe the commutator as a "nightmare," having regard to the quite satisfactory operations of thousands all over the world, is to convey a totally wrong impression to the inexperienced inquirer.

I hope no gas-works engineer will feel inclined to adopt a three-phase system on the strength of Mr. Johnson's statement that only 75 per cent. of the copper used for direct-current distribution is needed when three-phase working is adopted. Mr. J. F. C. Snell (President-Elect of the Institution of Electrical Engineers) gives the following figures as to relative weights of copper required for various systems:

	System.	Relative Weight of Copper.
D.C.	Two wire	100
	Three wire	29
A.C.	Three-phase "mesh"	78
	Three-phase "star"	29

Moreover, Mr. Snell makes it clear that direct-current distribution can easily hold its own up to a radius of 1 to 1½ miles, so far as total capital costs of installation are concerned. And in addition to first cost, there is the question of simplicity. In Mr. Snell's own words: "Simplicity is a fundamental requirement wherever attainable; and as this [direct current] system enables the simplest of generating machinery and distributing systems to be adopted . . . every engineer would undoubtedly use it wherever possible."

The foregoing, together with a great deal of other interesting and useful information, will be found in a paper on the distribution of electric energy read before the Institution of Civil Engineers on Nov. 22, 1904, by Mr. Claverton Snell—see "Proceedings," Vol. CLIX.

Upminster, Essex, April 2, 1914. HUGH P. VOWLES.

Coke-Oven Gas for Town Lighting.

SIR,—Your issue of March 3 contained a letter from the Koppers Coke-Oven and Bye-Product Company, of Sheffield—*re* "Coke-Oven Gas for Town Lighting"—which ends with the statement that "the arrangement made with Koppers for the use of certain of his patents only applies to Germany." In order to refute this, our parent Company (Dr. C. Otto and Co., of Dahlhausen, Germany) beg you to publish the following statements on their part:—

1. We made no arrangement whatever about the use of any Koppers patent.

2. In a suit before the German Office, the patent for the direct Koppers ammonia process was declared null and void. We withdrew our nullity application because Koppers signed a declaration "that the superheating of the gas and the re-introduction of the distilled-off ammonia are permitted to the firm Dr. C. Otto and Co. and those who hold licences under their patents."

How much certain difficulties to which Mr. Ford refers in his paper have been exaggerated by our competitors is evident from the fact that we have had no cause in this country to adopt the device mentioned to superheat the gas before the saturator, though we have every right to do so, if we wish.

THE OTTO COKE-OVEN CO., LTD.
per W. HIBY, Managing-Director.

Leeds, April 2, 1914.

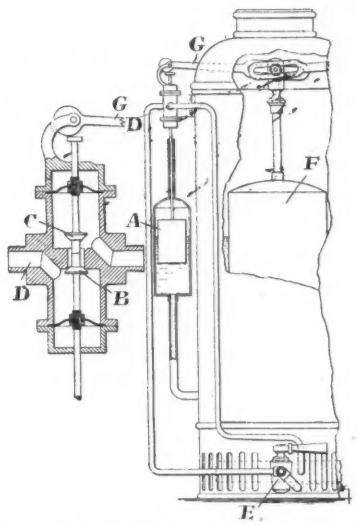
REGISTER OF PATENTS.

Water-Heaters.

STOTT, V. H., and SCHOFIELD, L., of Oldham.

No. 5432; March 4, 1913.

This invention relates to the control of the supplementary gas supply for keeping water continuously on the boil, as set forth in patent No. 6996 of 1912; the object being to provide for automatically shutting off the supplementary supply of gas when sufficient evaporation in the water-vessel has taken place, after the water and main gas supply have been cut off.



Stott and Schofield's Automatic Water-Heater.

The float A rises and falls in a chamber connected with the water in the water-vessel, and through the medium of a spindle the float is connected with two valves B C in the valve box of the supplementary gas supply. When the vessel is filled with water, the float rises and carries the lower valve to its seating, thereby closing the supplementary gas supply at D. When the main gas-valve E is opened and the water boils, the ordinary float F of the vessel rises, and when the water and gas supplies are cut off, the float falls, and, in falling, the heel on the lever G presses down the spindle, and the valve already closing the supplementary gas or steam supply is pushed away from its seating, so as to cause gas to pass through the supplementary supply. When the water is not being drawn off, it is kept continuously on the boil in this manner by the constant rising and falling of the float F. Continuous boiling brings about considerable evaporation, which lowers the water line in the vessel and the chamber containing the float A, and consequently lowers the position of the float until it eventually falls so low as to bring the other valve C on to its seat. When this occurs, the gas is shut off through the supplementary service and all evaporation stopped.

Treating Coal Tar for the Removal of Properties therein Tending to Induce Pitch Cancer.

ROBINSON, H.W., of Sedgley, Stafford.

No. 4159; Feb. 18, 1913. No. 10,156; April 30, 1913.

The patentee, in the course of his complete specification for this combined invention, says: Recent experiments have been directed to the problem of ascertaining the causes of cancer among workers in the industries producing and using pitch. A recent publication on the subject, "The Problem of the Gas-Works Pitch Industries and Cancer," gives particulars of researches showing what results have been obtained in experiments with samples of pitch and oils obtained from coal—that cancer would only be induced when two different classes of substances were present (these being known under the names of auxetics and kinetics respectively). Either of these alone will not induce cancer; but when both are present, cancer may be induced in workers who are constantly working in the presence of dust containing these substances.

Various ways were suggested of treating either the pitch or tar in order to remove from it either the auxetics or the kinetics, and then render it innocuous in so far as the inducing of pitch cancer was concerned. It was suggested, for instance, that the desired result could be obtained by mixing a considerable amount of water with the tar, when the water would dissolve out some of the constituents of the tar. The aqueous solution was then to be separated from the tar by centrifugal action or otherwise. Experiments on the resulting pitch and oils showed that the kinetics could be removed in this way, and usually also the auxetics. But the process is not a practicable one, for the present at any rate, from the point of view of the tar distiller. The expense is too great, and valuable constituents of the tar are dissolved out by the water.

The patentee has therefore made some experiments with the object of ascertaining whether the addition of some chemical substance to the tar would produce the desired result at a comparatively small expense, and without deleteriously affecting the value of the tar and of the products obtained from it. In so far as these experiments have been carried up to the present, it has been found, he says, that an addition of even small quantities of formaldehyde to the tar, at a convenient

stage in the distillation process, produces at least beneficial results—the pitch obtained being free from auxetics, or containing only small traces, so that it would be comparatively harmless so far as the risk of inducing cancer is concerned. This action of the formaldehyde is doubtless due to its property of condensing organic nitrogen compounds; these being the compounds in the tar which, by the research above referred to, are shown to have auxetic properties.

In place of formaldehyde, para-formaldehyde or other aldehydes may be used, as it is found that the action in question is due to the presence of an aldehyde, and practically all aldehydes act, to some extent at least, to get rid of auxetics. For example, acetic aldehyde may be used, or other aldehydes of the fatty group. The amount of the aldehyhe added, and the stage in the process at which it is added, will vary according to particular requirements, and to the condition of the tar or pitch to be treated. It is not essential for most purposes to add the aldehyde in a pure form, and substances containing a suitable aldehyde, or capable of yielding an aldehyde during subsequent treatment of the product, may be added to the tar or pitch. For example, sugar decomposes at a temperature below 250° C. with formation of formaldehyde; and for some purposes it may be cheaper or better to add sugar or the like to the product before or during the heating process in order to insure the presence of sufficient aldehyde to render the resulting pitch substantially free from auxetics.

When formaldehyde is to be added to the tar during the distillation, it is generally most convenient to effect the distillation in the ordinary way until the carbolic acid and the earlier creosote fractions have been taken off. When the temperature of the residue in the still reaches about 250° to 270° C., the distillation of further fractions, consisting of heavy oils and so forth, is assisted by a current of steam introduced through a perforated pipe in the still, and the formaldehyde may be introduced conveniently with the steam. Alternatively, the temperature of the material in the still may be reduced if necessary, and the formaldehyde, or a substance capable of yielding a suitable aldehyde, may be simply added before heating further to continue the distillation.

The invention is not limited to the particular ways of adding the formaldehyde or its equivalent as described and illustrated in the specification. Any suitable method may be adopted of adding it at any convenient stage in the distillation, or to the pitch residue after the completion of the distillation.

Incandescent Gas-Mantles.

THOMPSON, H. S., of Oldham, and SUTTON, C. J., of Bolton.

No. 5480; March 5, 1913.

This invention consists in weaving the fabric of mantles of alternate tubular and solid parts (or parts having all the warp threads woven together), while in the intervening parts half of the warp threads formed one half of the tubular part and the other the other half of same. Into these tubes are automatically woven, in their proper positions, the different threads necessary for drawing the lower ends of the inverted mantles into the shape, and the threads for tying the mantles upon their supports; while, in the case of upright mantles, a single thread alone may be interwoven with the fabric for the purpose of afterwards drawing that part of the fabric forming the upper end of the mantle into the shape desired.

Removing Sulphuretted Hydrogen from Gases.

BURKHEISER, K., of Hamburg.

No. 13,724; June 13, 1913.

The patentee points out that the specification accompanying his patent No. 16,172 of 1912 related to a process for the removal of sulphuretted hydrogen from gases by means of an alkali solution, containing sufficient alkali to effect the complete absorption of the sulphuretted hydrogen, with the chemically equivalent quantity of hydrated oxide of iron in suspension for the purpose of regenerating the alkali during the absorption process from the alkali sulphide formed.

A method of working was also described (confirmed by practice) which consists in undertaking the purification of the gases in the following order: Tar, sulphuretted hydrogen, ammonia. Now, according to this method of working, the absorption of sulphuretted hydrogen must take place with the gases still laden with ammonia. There is, therefore, the possibility of using the ammonia of the gases as the alkaline absorption medium for sulphuretted hydrogen. For this purpose the gas still containing sulphuretted hydrogen and ammonia is conducted through a washer charged with the regenerating medium in suspension—hydrated oxide of iron. The washing liquid absorbs ammonia from the gases, but only until a state of equilibrium has been established between the vapour tension of the ammonia contained in the liquid and the vapour tension of the ammonia contained in the gases.

It is necessary that a quantity of ammonia in solution, appropriate to the sulphuretted hydrogen content of the gases, should come into contact with the gases to be purified. But, as already stated, the quantity of ammonia contained in the gas bears a perfectly definite relationship to the quantity of ammonia contained in the washing liquid—an exchange taking place, according to the vapour tension of the ammonia of the gases and of the ammonia of the liquid, until the attainment of a state of equilibrium. In other words, if the vapour tension of the ammonia in the gas is greater than that in the washing liquid, ammonia will be absorbed by the liquid; in the opposite case, ammonia previously absorbed is again given up by the liquid to the gas.

Now, the object of the present invention is, by regulating the temperature of the washing liquid, so to fix the vapour tension of the ammonia in the liquid that this always contains as much ammonia as is appropriate to the quantity of sulphuretted hydrogen to be absorbed. For the vapour tension regulates the proportion of the ammonia in the two ammonia carriers (liquid and gas); and as the temperature is a function of the vapour tension, it is possible, by regulating the temperature, so to control the absorption of sulphuretted hydrogen that it is complete in all circumstances. On the other hand, too much ammonia remaining behind in the purifier and in circulation is avoided.

In the practical working of this process, it has been found that in ordinary cases the temperature is preferably kept between 40° and 50° C.; but, according to the high or low ammonia content of the gases, the temperature may be varied above or below these limits.

There are said to be many means of attaining this object—for example, by warming the mass in suspension before introduction into the purifier, by warming the purifier from the exterior, by conveying the heat to the purifier, by reheating or superheating the already cooled gases, or by a combination of two or more of these means.

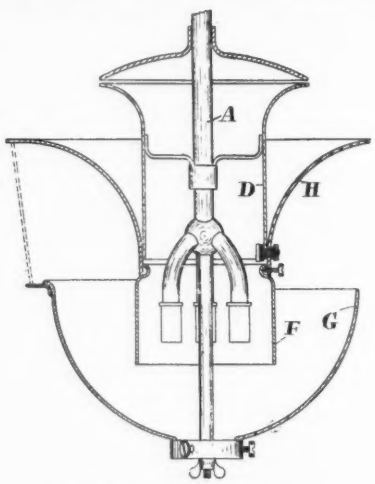
If the separation of the tar is effected below the natural dew-point of the gases for water, it is further imperative to treat the resulting condensates which contain ammonia in a distilling column, and to again convey the ammonia vapour to the gas in so far as it may be desired—for example, to combine the process with a so-called direct ammonia recovery process. In this case the heat of the ammonia containing vapour from the distilling column may be used in a specially economical manner if the vapour is again mixed with the gas immediately before the purifier or in it. An exceptionally economical method of working is attained if the heat contained in the gas is, without further complication, used to produce the temperature necessary for the process in the purifier—that is to say, if the separation of tar is effected in the gas while still warm, and the gases introduced into the purifier while still warm. In this case all condensates separating out beyond the purifier are free from cyanogen, sulphocyanide, and sulphuretted hydrogen. They contain only ammonia; and "the waste liquid arising from the treatment of these condensates may therefore be allowed to run into river courses without danger."

Indirect and Semi-Indirect Incandescent Lamps.

BIHELLER, S., of Chiswell Street, E.C.

No. 14,282; June 20, 1913.

For the purpose of illustrating his invention, the patentee shows a lamp adapted to employ a plurality of mantles. Surrounding the gas-pipe A is a metal cylinder D, disposed concentrically to the gas-pipe so that an annular space is provided between the pipe and the cylinder.



Biheller's Semi-Indirect Gas-Lamp.

Leading into the cylinder near its lower end, or at the lower end of the deflector H, is a second cylinder F, of transparent material (such as heat-resisting glass) of approximately the same diameter as D. The cylinder F extends to within a short distance of the concave surface of the opaque or semi-transparent bowl or reflector G, which may be attached to a rod depending from the pipe A, or be suspended by chains from the deflector H, as indicated by dotted lines. The deflector H is made of white enamelled metal, shaped as an inverted truncated cone, concavely curved so as to reflect the light rays outwardly and downwardly.

Discharging Carbonized Products from Vertical Retorts.

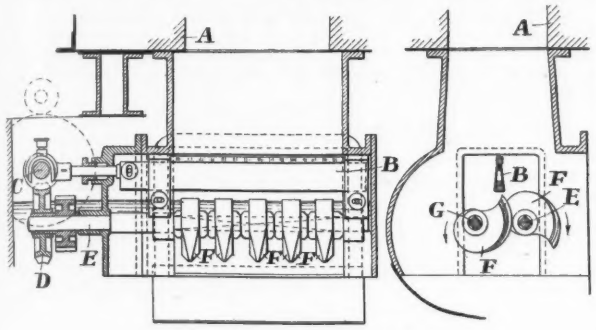
AARTS, J. G., of Dongen, Holland.

No. 17,612; July 31, 1913. Convention date, Aug. 1, 1912.

The apparatus forming the subject of this invention consists in a breaking-off or knocking-off tool which is constituted by a projecting portion of a spiral-shaped cam which is mounted upon a horizontal shaft and supports the carbonized mass; the cam being keyed upon a shaft and continuously rotated. Being of a spiral contour, the cam allows the mass resting upon it to descend gradually. At the moment when resting upon the portion of the cam having the least distance from the shaft, the mass is attacked by the picking projection, so that during each revolution the mass is cut from the centre towards the periphery, and discharged continuously from the retort. The peripheral portion of the mass is during this operation already out of contact with the walls of the retort proper.

The coke, which is already cooled to a certain extent, passes from the lower portion of the retort indicated at A into an enlarged chamber below, and is divided by the saw B into two equal longitudinal portions. The saw (mounted in the guides) receives a reciprocatory movement from a link which is carried outwardly through a stuffing box, and

driven from the shaft C by means of an eccentric. The shaft drives, by means of a worm-screw, a worm-wheel D, mounted on a shaft E, upon which spiral cams F, spaced apart by collars or other suitable means, are rigidly mounted. The cams are provided with projections which serve for cutting or breaking the charge. Parallel to the shaft



Discharging Coke from Vertical Retorts.

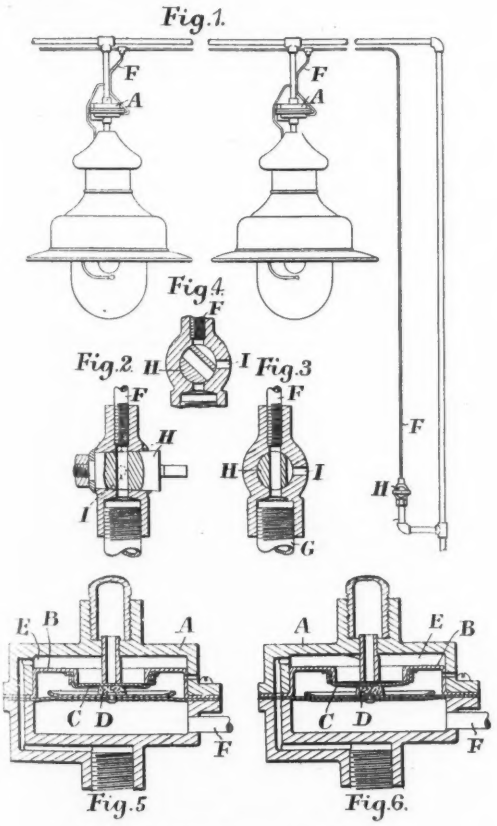
E, and in the same plane, is arranged a second shaft G, carrying cams which during their rotation take between the cams of the shaft E. A toothed gear, mounted upon the shaft G, meshes with a gear mounted upon the shaft E, so that the reciprocatory movement of the saw and the rotation in opposite directions of the shafts E and G are derived from the same driving shaft.

Distant Control of Gas-Valves.

SHAW, A. B., of Medford, Mass., U.S.A.

No. 19,507; Aug. 28, 1913.

This invention is particularly applicable to inverted street gas-lamps when suspended in an elevated position so that they cannot be readily reached. It relates to a device which renders it possible to control the illumination of lamps by a valve a considerable distance away, and in a position readily accessible, "whereby gas at normal pressure is supplied through a supplementary pipe to operate the gas-valve supplying the burner."



Shaw's Distance Street-Lamp Controller.

Fig. 1 is an elevation of the lamp-controlling device, figs. 2 and 3 are vertical sections of the auxiliary valve at right angles to each other, fig. 4 is a partial section showing the valve plug closed, fig. 5 represents a vertical section of the main valve mechanism interposed between the lamp and the supply pipe—shown in a position to shut off the gas supply. Fig. 6 is a similar view, but with the supply on.

The main valve mechanism A is made in two parts, between the flanges of which is clamped a diaphragm, immediately above which is a cup-shaped member B having a central perforation surrounded by an annular downwardly extending flange. Across the perforation and secured to the flange is a flexible member C hermetically sealing the opening through B. Extending through the upper wall of the casing, and communicating with the branch supply pipe, is a nozzle the lower end of which is substantially in the same plane with the lower edge of the annular flange; while immediately beneath the opening is a rigid disc, superimposed on which, immediately beneath the discharge nozzle, is a yielding projection D of cork or other similar material. Communicating with the upper compartment E is a passage, the opposite end of which communicates with the pipe leading to the lamp. Extending from the lower compartment is a small connecting pipe F, the opposite end of which is connected to a valve casing mounted upon a branch G from the main supply pipe, and which, with the valve casing thereon, may be placed "at any desired position where it will be readily accessible when it is desired to control the supply of gas to the lamps." The valve plug casing has a diametrical opening through it, so that the gas from the branch pipe can pass into the connecting pipe F when the plug is in the fig. 3 position.

When gas under pressure in the main supply pipe is permitted to flow through the branch pipe G and the valve H into the pipe F, pressure will be admitted to the lower compartment which will act upon the diaphragm when in the position shown in fig. 6, to move it upwards into the position shown in fig. 5; the projection D holding the flexible member C in contact with the end of the inlet nozzle so as to close the valve and shut off any further admission of gas through the nozzle into the upper compartment E. Obviously, when the supply of gas into E has been shut off, the light remains extinguished as long as the valve H is in the position indicated in fig. 3.

When the time comes to light the lamps, the valve plug H is turned into the position shown in fig. 4, thereby shutting off further supply of gas in the pipe F. One side of the valve plug is cut away, so that when the plug is in this position the end of the pipe will communicate with the discharge outlet I, thereby permitting the escape of gas or air, and reducing the pressure contained within the pipe F or the lower compartment. The gas in the supply pipe is always under normal pressure; and as it passes into the upper compartment it acts upon the flexible member C, moving it downwards into the position shown in fig. 6, so that a free passage of the gas to the burner of the lamp is assured to be lighted by the pilot. When it is desired to again extinguish the lamp, the valve plug is turned into the position shown in fig. 3, and a new supply of gas under normal pressure is admitted to the lower compartment to close the nozzle again and prevent the further admission of gas to the compartment E—thus cutting off the supply of gas to the burner.

Purifying Gas.

WALLWIN, J. M., of Salford, and SINNATT, F. S., of Higher Broughton Manchester.

No. 28,682; Dec. 12, 1913.

This invention consists in mixing cork with the purifying material such as hydrate of iron; the cork being reduced to small particles (say, about ¼ inch) and mixed with the oxide, in the proportions for preference, of one part by volume of cork to three parts by volume of purifying material. With the cork thoroughly mixed with the purifying material and the mixture placed on grids in the purifier, "it is found that most satisfactory results are obtained; the mass of purifying material being maintained at all times in an open porous condition and never clogging-up, and the whole of the gas being effectively purified."

The solidifying or clogging-up of the purifying material is (according to the patentees) principally caused by (1) the moisture present in the gas, (2) the weight of the purifying material, (3) the chemical action of purification.

In regard to the weight of the material, it will be seen that, with a layer 24 inches deep, the bottom layer of 1 inch will be compressed by the weight of the other 23 inches, and "under such weight there is a great tendency to solidify; and this may rapidly increase." The addition of cork not only serves, as previously stated, "to keep the purifying material loose and non-agglomerated, but it also ensures that the whole of the material shall be used to the best advantage."

In regard to the chemical action, as the purifying material acts on gas, it increases in both volume and weight. Since the material is contained in a closed vessel, this increase in volume and weight tends to solidify the purifying material. When cork is added, the spongy nature of the cork allows for the expansion by becoming compressed. Further, with any variation in temperature or moisture, the cork expands and contracts, "which tends to agitate the mixture."

Killed at the Manchester Gas-Works.—A verdict of "Accidental death" was returned at a Manchester inquest, on Monday of last week, on the body of Joseph Hynes (22), a chemical worker, of Newton Heath, who was crushed between a crane and the buffers of a waggon he was assisting to load at the Manchester Corporation Gas-Works, Bradford Road, two days previously. It was shown that the man's ribs were fractured, and two of them penetrated the lungs, thus setting up pneumonia, which proved fatal.

Tavistock Gas Company.—The report adopted at the annual meeting of this Company stated that the sale of gas for the year showed a satisfactory increase; but the cost of manufacture had been greater. The balance at the credit of profit and loss was £1246, after payment of income-tax and an interim dividend. A final dividend was declared for the year of 4s. 7d. per share on the original capital, and 3s. 2½d. per share on the additional capital, free of income-tax—making, for the year, 8s. 4d. on the original £5 shares, and 5s. 10d. on the £5 additional shares. Mr. Doble said he thought it would be as well for the consumers to understand that the present dividend was in respect of the profits on the past year. The decision of the Directors not to allow the usual discount of 3d. per 1000 cubic feet was in anticipation of the reduced profits consequent on the large increase in the price of coal.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:

Bills reported with amendments: Llanfaelog Water; Skegness Gas; British Gas Company (Hull Station); Mexborough Urban District Council; Leighton Buzzard Gas; Ellesmere Port and Whitby Urban District Council.

Bills read the third time, passed, and sent to the Commons: Stone Gas and Electricity; Cleckheaton Urban District Council; South Bank and Normanby Gas; Whitwell and District Gas; Skegness Gas; Leighton Buzzard Gas; Newport Corporation; Llanfaelog Water; British Gas Company (Hull Station).

Bills brought from the Commons and read the first time, and reported to the Examiners: Bedwas and Machen Urban District Council; Riddings District Gas; Kidsgrove Gas; Leyland Gas.

The Ashington Urban District Council Bill was read a second time and committed. A petition has been presented against the Bill by the Ashington Coal Company and others.

The Gas Light and Coke Company Bill, Chelmsford Gas Bill, Longwood and Slaithwaite Gas Bill, Liverpool Gas Company Bill, Hightown Gas and Electricity Bill, and Edenbridge Gas Bill have been referred to a Select Committee consisting of Lord Clinton (Chairman), Earl Lonsdale, Lord Erskine, Lord Monkswell, and Lord Gorell; to meet on Tuesday, April 28.

The Porthcawl Urban District Council Bill and the Weston-super-Mare Urban District Council Bill have been referred to a Select Committee consisting of the Earl of Plymouth (Chairman), Earl Londesborough, Viscount Hambleden, the Earl of Crawford, and Lord Pontypridd; to meet on Wednesday, April 29.

The Manchester Corporation Bill and West Gloucester Water Bill have been referred to a Select Committee consisting of Earl Camperdown (Chairman), the Duke of Sutherland, Earl Hardwicke, Lord Berwick, and Lord Charnwood; to meet on Wednesday, April 29.

The Bristol Water Bill has been referred to a Select Committee consisting of Earl Lytton (Chairman), Marquis of Linlithgow, Lord Fingall, Lord Basing, and Lord Channing; to meet on Tuesday, April 28.

HOUSE OF COMMONS.

The Lurgan Gas and Electricity Bill was read a second time and referred to the Examiners.

Bills read the third time and passed: Riddings District Gas; Kidsgrove Gas; Leyland Gas.

Bills brought from the Lords, read the first time, and referred to the Examiners: Stone Gas and Electricity; Cleckheaton Urban District Council; South Bank and Normanby Gas; Whitwell Gas; Skegness Gas; Leighton Buzzard Gas; Newport Corporation; Llanfaelog Water; British Gas Company (Hull Station).

The South Suburban Gas Bill, referred to the Examiners after the second reading, has now been committed.

The petitions of the Sandwich Corporation against the Deal and Walmer Gas and Electricity Bill, the North Eastern Railway Company against the Middlesbrough Corporation Bill, and the Batley Corporation against the Ossett Corporation Bill have been withdrawn.

Another petition withdrawn is that of the Port of London Authority against the City of London Various Powers Bill.

The Examiners reported that the Standing Orders in respect of the petition for an additional provision in the Walsall Corporation Bill had not been complied with.

Resolutions were reported from the Standing Orders Committee that Standing Orders ought to be dispensed with, and the additional provisions petitioned for inserted in the Middlesbrough Corporation Bill, Hightown Gas and Electricity Bill, and South Suburban Gas Bill, if the Committees on the Bills see fit.

Notice was given for the rejection, on consideration, of the Southend Gas Bill, as amended.

The Market Rasen Water Bill, Gas Provisional Order (No. 1) Bill, and Alliance and Dublin Gas Company (Electric Supply) Bill have been referred to a Select Committee consisting of Sir Edwin Cornwall (Chairman), Mr. Bigland, Mr. Daniel Boyle, and Mr. Mackinder; to meet on Tuesday, April 21.

German Coal for London Gas-Works.

Sir J. D. REES last Wednesday asked the President of the Board of Trade whether he had information to the effect that gas companies in London were importing coal from Germany; and, if so, whether this new departure was due to the increased cost of production in this country.

Mr. ROBERTSON, in reply, said: I am informed that considerable quantities of German gas coal have been purchased for the manufacture of gas in London. This is, no doubt, due to considerations of price; but I am unable to discriminate between the causes which may at the moment have rendered the German more favourable than the English market as a source of supply for London gas-works.

BRITISH GASLIGHT COMPANY (HULL STATION) BILL.

This Bill was ordered to be reported for third reading by the Unopposed Bills Committee of the House of Lords last Tuesday. The object of the Bill is to authorize the British Gaslight Company to spend further capital upon their works at Kingston-upon-Hull. Originally the sum of £400,000 was in the Bill as the additional capital; but Mr. Seager Berry (Messrs. Sherwood and Co., Parliamentary Agents) informed the Committee that the amount has been reduced to £300,000.

MIDDLESBROUGH CORPORATION BILL.

HOUSE OF COMMONS LOCAL LEGISLATION COMMITTEE.

Tuesday, March 31.

The objects of this Bill are to authorize the County Borough of Middlesbrough to acquire the undertaking of the North Ormesby Gas Company, and to confer further powers upon them with regard to their gas and electricity undertakings.

Mr. W. J. JEEVES, on behalf of the Corporation, dealt with the rapid development of Middlesbrough since 1830. Last year the borough had been extended to include the greater part of the Ormesby Urban District; and this necessitated the purchase of the North Ormesby Gas Company's undertaking. The Middlesbrough Corporation already had an extensive gas undertaking of their own, which was in a very flourishing condition; and they had agreed with the North Ormesby Gas Company to buy their undertaking for £26,000. So that, instead of asking power to sanction their buying upon arbitration terms, as contemplated in the Extension Act of 1913, the Corporation were now asking Parliament to confirm the purchase at the price named. This, he thought, was eminently desirable for the good of the Corporation, inasmuch as great expense was saved. The Rural District of Middlesbrough had originally opposed the proposition to acquire the Gas Company; but an agreement had been come to, and their petition was withdrawn.

There was no other opposition to the gas clauses of the Bill, which were gone through in detail by the Committee.

Mr. *J. Calvert*, the Chairman of the Gas and Electricity Committee of the Middlesbrough Corporation, gave evidence as to the need for clauses 25, 26, and 27 of the Bill, which gave power to the Corporation to substitute a calorific for an illuminating test. [The standard proposed is 125 calories net per cubic foot; the penalty line being 112 calories.]

The now well-known reasons for the substitution of the calorific power test were explained to the Committee. Although in practically all the other Gas Bills before Parliament this session it has been agreed to postpone the final wording of the clause until a decision is given on the Gas Light and Coke Company's Bill, in this case the Middlesbrough Corporation pressed the clause as drafted in the Bill, and asked for a decision, preferring to lose the clause altogether rather than postpone it. Some question then arose as to whether the calorific value should be expressed in net calories or in British thermal units.

Mr. R. H. FOX (Messrs. Torr, Durnford and Co., Parliamentary Agents) said that the Redcar Act of last session gave it as 125 net calories, as in the Bill.

No alteration was made; and the clauses were sanctioned.

Mr. *Calvert* then spoke as to clause 30, which was eventually passed in the following form:

> The Corporation may enter into and carry into effect agreements with any company or person for the supply of gas in a crude or partially purified state or condition to the Corporation for such remuneration, on such terms and conditions and for such period, as the Corporation may think fit.

This is a very interesting proposal on the part of a gas undertaking. No comment was, however, made upon it by the Committee. The Bill also contains a few other clauses, all in the model form.

This concluded the consideration of the Bill so far as gas matters were concerned.

Arrangements have been entered into with a local firm to take the whole of their supply of unpurified gas. The Corporation believe that this will enable them to do three things—to supply gas very cheaply, to enable the reduction of the outstanding capital expenditure on the gas undertaking to be carried out more rapidly, and to still further reduce rates by the aid of the extra profits on the gas undertaking. A clause allows the Corporation to make further arrangements of this character with other local firms, of whom there are several. A not unimportant feature is that, in the event of a coal strike, the quantity of gas so obtained will enable the undertaking to be carried on without reducing the output in the slightest degree.

NEWPORT CORPORATION BILL.

HOUSE OF LORDS COMMITTEE—Friday, March 20.

(*Before the Marquis of* BATH, *Chairman*, *Lord* AVEBURY, *Earl* HARROWBY, *Lord* O'HAGAN, *and Earl* ONSLOW.)

The object of this Bill is, *inter alia*, to extend the electricity supply area of the Newport Corporation.

Mr. J. D. FITZGERALD, K.C., and Mr. F. N. KEEN appeared for the promoters; Mr. BALFOUR BROWNE, K.C., and Mr. A. M. PADDON represented the Newport Gas Company, and the Hon. TREVOR LEWIS the South Wales Electrical Power Distribution Company.

Mr. FITZGERALD, addressing the Committee with regard to Part VI. of the Bill, which deals with the extension of the electricity supply area of the Corporation, said that the Corporation had spent £300,000 upon their electricity undertaking, but wished to extend their area to include

the parishes of Malpas, St. Woollos, Rogerstone, Duffryn, and Graig, in the rural district of St. Mellons; the parishes of Christchurch and Nash in the rural district of Magor; and the urban district of Caerleon, all in the area of supply of the Gas Company. There was no supply of electricity in these areas. Any consumer who required it was obliged to set up a private installation, which was not practicable in a house of ordinary size; and requests had been made to the Corporation of Newport to extend their mains so as to give a supply on ordinary terms. The laying of the mains would incur very small expense, inasmuch as they at present ran up to the borough boundary. The local authorities in the areas concerned were not opposing; on the contrary, some of them were welcoming the supply of electricity. The only opposition to the proposal was from the South Wales Electric Power Distribution Company and the Newport Gas Company. The former Company were authorized by Parliament in 1900 to give a supply in bulk, if required, over a very large area in South Wales. This area includes the whole of the County of Glamorgan, with the exception of the county boroughs, and a large part of the County of Monmouthshire. The Company could also supply electricity for power purposes; but they had no authority to supply electricity for lighting. The history of the Company was not a very attractive one, and their financial career had been disastrous. They had never paid any dividends at all; and their debenture interest had been in arrear for years. In certain areas the Company had attempted to give supplies, but eventually had had to sell these undertakings to local authorities at considerable financial loss. The Company had set up the perfectly impossible proposition that when a power company obtained a large area no one else was to be allowed to supply light there, although they themselves were prohibited from giving a supply for lighting purposes. The opposition of the Gas Company was equally illogical. Of course, there was some competition between the Corporation and the Gas Company for lighting in Newport. This was a very desirable state of affairs, and nothing had done so much to improve the gas industry as the competition it had encountered with electricity; but outside Newport this did not exist. There were no electric mains there; and the proposition which the Gas Company wanted the Committee to affirm was that there should be no competition outside Newport. He ventured to say that this was an impossible contention; and to support it the Gas Company's petition was full of unfounded charges against the management of the electrical undertaking. The real object of the opposition of the Gas Company was that they were trying to get inserted a clause which they knew would hamper the carrying on of the electrical undertaking of the Corporation, and would most probably prevent any effective competition between gas and electricity. Dealing with the "Northumberland" clause, the learned Counsel said that though this might be applicable to small undertakings, it was wholly inapplicable to a large commercial borough like Newport. In 1906, two years after the "Northumberland" clause had been framed, the Newport Corporation were in Parliament, and the Gas Company opposed them, raising exactly the same question. When the Bill came before the Committee of the House of Lords, a similar petition to the present one was put in; and after considerable discussion the proposal to impose the clause was rejected. Dealing specifically with the petitions, Counsel pointed out that, although the Electric Company had powers for fourteen years in the proposed area, they had never exercised them. The Gas Company, in their petition, stated that the financial position of the electric undertaking of the Corporation was unsound, and that the large expenditure which it was alleged would be necessitated in the new area would be unjustified under the circumstances. As a matter of fact, however, the expenditure upon mains in the added area would be a very small matter. It was also alleged that there would be interference with the gas mains by the laying of additional electricity mains; but it was pointed out to the Committee that there are most elaborate provisions under the Electric Lighting Clauses Act for the prevention of any such thing. These allegations had been put into the petition to cover the real desire of the Gas Company, which was that the "Northumberland" clause should be inserted in the Bill in order to prevent competition with the Gas Company.

The CHAIRMAN asked whether the Newport Corporation Act of 1906 sanctioned a supply outside the borough.

Mr. FITZGERALD said that the proposals then did not apply outside the borough at all. Continuing, he said that the St. Mellons Rural District Council had decided to oppose this part of the Bill, but had withdrawn their opposition on the insertion of a protective clause, which provided that the Corporation should, if desired by the Council, supply electricity in bulk to the Council for distribution within the limits of the parishes of the rural district—the price to be mutually agreed upon between the two parties, or, in case of dispute, to be determined by arbitration. The Council could also, at any time after two years and before the expiration of 42 years, on giving not less than six months' notice, require the Corporation to sell them that part of their electricity undertaking which is situated in such parts of the parishes of Malpas, St. Woollos, Rogerstone, Duffryn, and Graig as is not within the County Borough of Newport, at an agreed price, or, failing agreement, to be determined by arbitration. This power of purchase was in addition to the power of the Council to purchase under section 2 of the Electric Lighting Act, 1888. The Council were also empowered to apply to the Board of Trade for the revocation of the Corporation's powers within the rural district under the provisions of the section of this Act providing that the Board of Trade may revoke powers if mains were not laid in a specified period.

Mr. *A. N. Moore*, the Borough Electrical Engineer to the Newport Corporation, gave evidence in support of the Corporation's area of supply being extended. He stated that it was the intention of the Corporation to ask Parliament to sanction the extension of the borough boundary in the near future, and that some of the parishes now being dealt with would be included. He also supported Counsel's statement that it would be an easy matter to extend the Corporation's mains to take in the proposed new area. The generating plant would be able to deal with the extra load, in view of the fact that it was now capable of generating 25 per cent. more energy than was required at present. There was a distinct demand for electrical energy in this area; and a few private installations had been put in. He also maintained that the competition between the Corporation and the Gas Company would be advantageous to the residents in the new area. Since 1900, in the borough of Newport the price of gas had been reduced from 3s. 8d. to 2s. 11d. per 1000 cubic feet, owing to the influence of competition. In the outside area, however, there being no competition, the higher prices had been maintained by the Gas Company, except in one or two districts.

Mr. BALFOUR BROWNE, in cross-examination, pointed out that the reason the "Northumberland" clause was not inserted in the Corporation Bill in 1906 was that they were not going outside their own limits. He maintained that if the electricity undertaking of the Corporation did not pay, the deficiency would fall on the rates. It was unfair that a private Company should compete with a rate-aided undertaking. The rateable value of the Gas Company was £6000; and they had to pay rates on this amount to allow the Corporation to supply electricity in competition with them. Counsel put it to witness that the electricity undertaking was supplying current for public lighting at a cheap price—namely, 1·8d. per unit, including maintenance—in order to supersede gas; but witness denied this. Counsel maintained that the "Winchester" clause would not do the Corporation any harm, but would protect the ratepayers. He referred to the case of Limerick, where a proviso was inserted in the Bill to the effect that the price of electricity was to reach the maximum before the undertaking was allowed to call on the rates in case of deficiency. It was also suggested that, in view of the Corporation wishing to extend their boundary, the inclusion of the proposed new area would prejudice Parliament in favour of the Corporation when the application was made. In regard to the 25 per cent. surplus plant of the electricity undertaking, Counsel held that it was a temptation to take on consumers at any price, in order to get a return for this surplus energy; but witness maintained that this was the amount of surplus energy usually provided for by electricity undertakings.

Mr. TREVOR LEWIS also cross-examined on behalf of the Electrical Power Distribution Company.

The CHAIRMAN said that, without committing themselves in any way, the Committee would like to consider whether the Corporation should go into the outside districts without restrictions.

Mr. KEEN subsequently replied that, after conferring with Mr. Fitzgerald, the promoters would consider the suggestion of the Committee, and bring up some form of restriction for the outside area.

Mr. *John Moxon*, the Chairman of the Electricity and Tramways Committee of the Newport Corporation, supported the evidence given by Mr. Moore. The Corporation had been asked to build houses in St. Woolloston, so that this would tend to increase the sale of electricity.

Mr. BALFOUR BROWNE mentioned that a number of members of the local Ratepayers' Association were going to protest against this municipal trading. Witness, however, said that all these gentlemen could be traced to the Gas Company. Counsel held that mains had been laid in roads where there was no necessity for them, which tended to show that the Corporation had been speculating in this respect with the ratepayers' money, and had failed.

Witness stated that, during the nineteen years that the electricity undertaking had been established, the Corporation had paid £57,000 to the Gas Company in respect of public lighting in the borough, and had only spent £41,000 on electric lighting. It would be possible for the Corporation to terminate all their agreements with the Gas Company, and so make a larger profit themselves.

Mr. KEEN, on behalf of the Corporation, said that, with reference to the unnecessary mains which Mr. Balfour Browne alleged had been laid, in some cases there had been guarantees of revenue.

Mr. TREVOR LEWIS also cross-examined on behalf of the South Wales Electrical Power Company, and obtained from witness the statement that many persons had asked the Corporation to supply an outside area, although they had no authority, whereas the Power Company, who had powers, had never been asked to supply.

Monday, March 23.

On the resumption of the proceedings to-day, Mr. *John Moxon*, continuing his evidence, referred to the streets in which it was alleged that long lines of cable had been laid where they were not justified. In 19 streets in which the Gas Company supplied gas, the Corporation had laid 5641 yards of mains and distributors, at a capital expenditure of £2404. On these mains they supplied 89 public lamps and 58 private consumers, and received a revenue per annum of £1216. The Corporation had received £5450 income from their expenditure in this direction. The charge for public lamps was £3 5s. per lamp per annum; so that the cost of the 89 public lamps was £289 per annum, which left £927 income from private consumers.

Mr. *T. H. Mordey*, a member of the Newport Corporation, said he approved of the powers taken in the Bill by the Corporation, and denied that the extension of the electrical undertaking would place a larger burden upon the rates.

This closed the case for the Bill.

Evidence was then called on behalf of the Gas Company.

Mr. *T. H. Hazell*, the Secretary of the Newport Gas Company, said that the proposal by the Corporation would be a bad thing for the rates. Burdens had already been thrown on them by unjustifiable changes in public lighting. Part of the plant at the electricity works had had to be scrapped, and replaced. The Corporation had been compelled to make this change by the Local Government Board. They had applied for wiring powers in 1906, which they said would improve their prospects. Instead of having smaller amounts charged to the rates, however, by the electricity undertaking, the amounts were getting larger year by year. The Corporation had fewer than 2000 customers for electric light in the borough, against 15,000 gas consumers, of whom over 11,000 were prepayment consumers. As matters stood at present, if there were two competing shopkeepers—one using gas and the other electricity—the former would have to pay his gas bill, and then contribute towards the loss on the electricity consumed by his competitor. The Corporation lighted all the main streets, which were profitable, by electricity, and left the Gas Company to light the small back streets.

In the event of the Corporation having powers to supply outside the borough boundary, the ratepayers in the borough would have to bear the whole of the loss in case of failure, as the Corporation could not claim rates for the residents outside their boundary.

In cross-examination by Mr. KEEN, witness said the Company did not want sympathy but fair dealing. The price charged for gas in Newport was 2s. 11d. per 1000 cubic feet, with an addition of 9½d. to prepayment meter consumers. The charge three or four miles outside the borough was 4s. 6d. to prepayment consumers, and 3s. 9d. to the ordinary consumers. The prepayment consumers, for the extra 9d., had the meter, cooking-stove, and three points of light, with the necessary fittings, which were all maintained by the Company. The Company never charged more than 10d. per 1000 cubic feet extra to prepayment consumers compared with ordinary consumers. Counsel pointed out that in Skegness the gas consumers had the same fittings free, and yet they were only charged 2½d. per 1000 cubic feet extra, to which witness replied that Parliament had fixed 10d. as a fair price, which was not the maximum, as maintained by Mr. Keen.

Mr. BALFOUR BROWNE, on behalf of the Gas Company, said in many cases the extra charge had been increased much beyond this price, although the Model Clause provided a maximum.

Witness said that originally the Gas Company were lighting the streets at 65s. per lamp per annum. Later on, however, the Electric Lighting Committee came along and said that, for purposes of economy, they would supply electric lamps at 57s. 6d., which, he claimed, was underselling the Gas Company. Later the electricity undertaking consulted an expert, who advised them as to the state of their concern; and he told them that a reasonable price for public lighting was 67s. 6d. per lamp. Instead of charging this price, however, they were now charging 65s.—the same as the Gas Company.

Mr. KEEN said that this showed the reverse of the desire on the part of the electricity undertaking to inflate their profits. He also said that it was the practice in provincial towns to light all the principal streets with electricity. Therefore Newport was no exception. With regard to the complaint made by the Gas Company that the Corporation had not scrapped their obsolete plant before they were compelled to by the Local Government Board, Counsel asked if it was not a handicap on the electrical undertaking in competition with the Gas Company. Witness did not agree, however. If the Corporation had carried on their electrical undertaking properly, they would have allowed for a depreciation fund. Counsel held that the revenue would not permit a special purposes fund to be provided. With regard to the electricity undertaking underselling the Gas Company, witness did not agree that there would be a loss on the electrical undertaking if the charge was put up, inasmuch as the people using electricity could afford to pay a reasonable price for it.

In answer to Mr. BALFOUR BROWNE, in re-examination, witness said that, owing to the fact that the Corporation were charging 65s. per lamp for electric lighting, whereas their expert had advised them to charge 67s. 6d., the electric undertaking made a loss on public lighting.

Mr. KEEN said that this did not necessarily follow.

The room was then cleared. On the re-admission of the parties,

The CHAIRMAN said that the Committee had come to the conclusion that the Corporation had not made out a sufficient case to justify the extension of their electricity undertaking in the outside area.

Mr. BALFOUR BROWNE asked that the "Northumberland" clause should be inserted in the Bill, to apply inside the borough.

Mr. FITZGERALD, on behalf of the Corporation, maintained that, with the Committee's decision, the whole of the electricity proposals were struck out.

Mr. BALFOUR BROWNE said that clause 64, dealing with the construction of electrical substations under streets, was not included in Part VI. of the Bill, upon which the Committee had given their decision. He was therefore entitled to be heard on this.

Mr. FITZGERALD said it was clear, from what Mr. Balfour Browne had said, that the real object of the Gas Company was to inferfere with the powers of the Corporation to enter into contracts to supply power to large works for a number of years. The "Northumberland" clause would take away from the manufacturer the certainty that he would continue to get for a number of years electricity at the stipulated price. These large contracts were those on which money was lost or made, which secured to electricity undertakings immense outputs for a number of years. The higher the output, the greater was the facility in turning out electricity at a cheaper price; and he asked that the Corporation should not be put into a position that they could not carry out their contracts. Rather than be put in this position, he would withdraw the clause. He had pointed out this very matter in 1906; and the proposal of the Gas Company was then rejected in Committee. The Gas Company were now asking them to reverse the decision of the Committee in 1906.

Mr. BALFOUR BROWNE said he was going to bring evidence to show that this would not hamper the electrical undertaking at all with regard to these large contracts.

It was decided, eventually, that Counsel should continue to call evidence on behalf of the Gas Company.

Mr. *William Cash*, in giving evidence in support of the Gas Company, said that, if the electrical undertaking was a new one, he could understand there being a deficit; but the concern had been in existence for nineteen years, and was still making a deficit. He maintained that the undertaking in the borough had been so worked as to be a serious burden to the ratepayers. With regard to the proposed new electrical works, where they would be able to turn out three times their present output, he agreed with the contention of Mr. Balfour Browne that they would make a very serious loss, which would fall on the Gas Company, as ratepayers. He did not see anything in the "Northumberland" clause which was unjust and which would hamper the undertaking at all.

Mr. KEEN, in cross-examination, asked whether witness saw any need for the clause if it was going to do no harm to the Corporation.

Witness said that he had never seen a stronger case in which it was called for.

Mr. *Thomas Canning*, the Engineer and Manager of the Newport Gas Company, also gave evidence as to the long lengths of cable laid by the Corporation for which there was not an adequate return. There were about 5461 yards of cable with very few consumers indeed on it. He also supported the evidence with regard to the insertion of the "Northumberland" clause. In Newport the poor class of people took gas, and the rich took electricity, but there was a certain class between the rich and the poor to whom it did not much matter which they consumed. If, however, after paying their gas bills, they found that they had to contribute towards the electricity, this would be an inducement to them to take electricity instead of gas.

Mr. KEEN, in cross-examination, said that for depreciation of plant, or cases of that sort, and also for carrying on the works, the money needed by the Company could be taken from their capital; while the Corporation had to borrow for the purposes of their electricity undertaking on the security of the rates. In this respect the two concerns were on a comparable basis.

Mr. *Arthur J. Stevens*, the President of the Newport Ratepayers' Association, said that his object in giving evidence against the proposal of the electricity undertaking was to obviate reckless expenditure of the ratepayers' money, and also to prevent unfair competition. He also stated that the Electricity Committee in Newport were the Lighting Committee, which, in his opinion, tended to give preference to electricity for public lighting as against gas. He would like to see the Lighting Committee altered, owing to the fact that the price charged was too little.

Tuesday, March 24.

The proceedings on the electrical portion of the Bill were concluded this morning.

Mr. BALFOUR BROWNE, addressing the Committee on behalf of the Gas Company, said he asked for fair competition as between the Corporation Electricity Department and the Company. An analysis of the electricity accounts showed that nothing was charged for the services of the Town Clerk and the Borough Treasurer, nor was anything charged for rent of offices. The only item of this character was a charge of £66 for collectors. He maintained that the accounts should have borne another £1000 per annum. Again, the assessment of the electricity undertaking was only £1900; whereas the assessment of the Gas Company's undertaking was £6700. Taking all these matters into consideration, he contended that the electricity undertaking would last year have shown a loss of £3173. There was no reserve fund and no provision for insurance. An increase in the charge for electricity of ½d. per unit would not lose the undertaking a single consumer, while it would have the effect of placing it on a sound financial basis. As matters stood, the Corporation were deliberately hoodwinking the ratepayers.

Mr. FITZGERALD, replying on behalf of the Corporation, resented the latter suggestion, and argued that the Gas Company should not have been allowed to raise the question of inserting the "Northumberland" clause in the Bill as regards the borough, since, by the Committee's decision, the proposed outside area had been struck out of the Bill.

The Committee having deliberated,

The CHAIRMAN announced that the Committee had decided not to grant the clause.

Greater significance attaches to the result of this Bill than is apparent on the face of the proceedings. It should be clearly pointed out that the "Northumberland" clause was not inserted in the Bill because the additional area which it was proposed to add to the Corporation's limits of electricity supply were struck out; but during the proceedings there was an intimation that if this area had been granted it would only have been done under certain restrictions. When the Gas Company subsequently applied for the "Northumberland" clause to be inserted in regard to the borough, the Committee only refused it on the ground that the clause was not *ad rem* to the remaining provisions of the Bill, and the application was rejected, but only after having a consultation with Counsel to the Lord Chairman.

MEXBOROUGH URBAN DISTRICT COUNCIL BILL.

This Bill was before the Unopposed Bills Committee of the House of Lords last Tuesday.

The events in connection with the Bill, and also that promoted by the Mexborough Water Company, are interesting. Early in the session the Mexborough Water Company introduced a Bill seeking for further powers; while the Mexborough Urban District Council at the same time deposited a Bill asking for compulsory purchase powers over the Water Company. The two Bills were included in a group to come before an Opposed Bills Committee of the Lords. But while the earlier Bills on the list were in progress, negotiations took place between the parties, and an arrangement was come to whereby the Council will purchase the Company's undertaking on arbitration terms.

Mr. C. E. BAKER (Messrs. Baker and Co., Parliamentary Agents) explained the circumstances to the Committee, and said that for the present the Water Company's Bill was suspended, but not actually withdrawn, in view of the possibility of the Council deciding to proceed with it, in order to obtain the further powers as regards the water undertaking asked for in it. The Company's Bill proposed to authorize certain new works. It is in respect of these that the Council have yet to make up their mind whether to proceed with them now or come in another session, after having considered the general position of the undertaking. The Local Government Board had reported upon the Company's Bill to the effect that the Committee should be satisfied that the existing water supply was good. Since the arrangements between the two parties, the Council had received a report from the West Riding Analyst, who stated that the water supplied by the Company was of the highest organic purity, and well suited for drinking purposes.

The Council's Bill was therefore ordered to be reported for third reading.

LEGAL INTELLIGENCE.

ELECTRICITY CHARGES AT LONG EATON.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Friday, April 3.

(*Before Mr. Justice* SARGANT.)

Attorney-General, At the Relation of the Long Eaton Gas Company v. Long Eaton Urban District Council.

By this action the plaintiffs claimed a declaration that the charges made by the defendants for the supply of electricity were an undue preference, and *ultra vires* within the meaning of the Electric Lighting Act, 1882.

Mr. MARK ROMER, K.C., and Mr. PERCY WHEELER appeared for the plaintiffs; Mr. MARTELLI, K.C., and Mr. COURTHOPE MUNROE represented the defendants.

Mr. ROMER, in opening the case, said the defendants were an Urban District Council with powers to supply electric energy within their district; and the plaintiffs claimed that a certain differentiation of charge which the Council were now making for current used for power purposes was in contravention of the provisions of sections 19 and 20 of the Electric Lighting Act, 1882—the sections relating to undue preference being given. The facts might be very shortly stated. The Council had obtained authority to supply electric energy under the Electric Lighting Order of 1900. Long Eaton, though in the County of Derby, was only about eight miles from Nottingham, the centre of the lace-manufacturing industry. Consequently there were within the district supplied by the Council a large number of factories where machine-made lace was made; and therefore a considerable amount of power was required. These factories might take both their light and power from the defendants, or they might do one thing or the other. They might light by gas and obtain their power from electricity, or they might do both by gas. Down to the differentiation of which the plaintiffs were complaining, the Council charged the same rate for power supplied to factories which were also lighted by electricity as they charged to those lighted by gas; and they made the same charge for electricity for lighting purposes when the machinery was driven by electric power as was made for lighting a factory in which the machinery was run by gas power. In September, 1911, however, they began to differentiate. In that month they issued a circular in the following terms:—

> Sir,—I am directed by the Council to inform you that the following resolution has been accepted with reference to the price charged for electricity to power consumers, and it will take effect as stated therein—viz., a revision of the electricity charges. The Committee have fully considered this matter, and recommend that the present scale of charges remain in force when the lighting and power are both taken exclusively from the Council's electricity mains. But in the case where the electrical supply is taken for power only, or for power and partial lighting, the lowest scale of charges, should the number of units consumed during any quarter exceed 4000, shall be 1d. per unit, and otherwise according to the existing scale.

The result of this differentiation had been that from the date when the circular took effect—viz., Jan. 1, 1912—the price had been raised to the manufacturer who partially lighted by gas. The effect had been that where a man lighted his factory by gas, or partially did so, he had to pay, instead of ¾d. per unit for a consumption above 6000 units, 1d. per unit—a differentiation of ¼d. per unit for the 6000 units, as against the man who lighted his factory entirely by electric light. He (Counsel) submitted that such a differentiation was forbidden by the sections of the Electric Lighting Act of 1882 previously referred to. There was no doubt that at the present time an electric light company could always differentiate in favour of the larger consumer against the smaller one; but this was not, as it appeared from their scale of charges, what defendants were proposing to do here. What they were doing amounted to an undue preference—that was to say, a preference that was undue with regard to what was set forth in section 19 of the Act. It was there stated that every consumer "shall be entitled to a supply on the same terms on which any other company or person in such part of the area is entitled under similar circumstances to a corresponding supply;" and the question here was what meaning was to be put upon the words "under similar circumstances" and "a corresponding supply." Section 20 said that the undertakers should not, in making any agreements for a supply of electricity, "show any undue preference to any local authority, company, or person." He took it that "undue preference" meant preference having regard to what was undue as stated in section 19—viz., if the Company purported to attempt to discriminate between consumers who, "under similar circumstances," were entitled to "a corresponding supply," then there was undue preference. It was, however, generally known that preferences were made all over the country. There were reasons for some of them. For instance, an electric lighting company were not like a gas company. They could not accumulate their electricity in the way that a gas company could store gas. The result was that an electric lighting company was bound to provide plant capable of taking the maximum load. This at a place like Long Eaton was at night. The factories worked very long hours—in some cases commencing at four o'clock in the morning and working till midnight; and consequently it was only natural that large consumers who took their power when the load was lightest should obtain some preference. If, however, a company purported to discriminate between consumers who, under similar circumstances, were entitled to a corresponding supply, they were guilty of undue preference. In determining to what extent an electric lighting company was entitled to give any preference, one always started with this: Electric lighting companies, unlike gas companies, could not store their energy. The greater number of factories in the neighbourhood in question were working at the time when the lighting load had to be met—that was to say, during the time of maximum load. It was consistent that those who wanted power when the energy for lighting was no longer required, and at the time when the portion of the plant needed for lighting was idle, should have a preference, as power was produced much more cheaply than light. To a difference between a charge for power supply and one for light supply no one could possibly object. If the differentiation was merely against persons who were using the light only at the period of maximum load, it would not be a controversial matter, but rather one of common sense; and it was in the nature of a very obvious discrimination. In all such cases the supplying authority was entitled to discriminate, because there was a difference in the cost of affording the supply. But let them look at what the defendants were proposing to do. They were proposing to differentiate between the consumer who took energy for both power and light, as against the one who took electricity for power only. It could not be said that the reason for this was any difference in the cost of the supply of energy in the one case as compared with the cost in the other. His submission was that the reason must be one of two things—the defendants were either discriminating because they wanted to obtain custom for lighting from those to whom they were supplying power, or because they thought that in this way they would be able to obtain more consumers for power. This, he concluded, was a differentiation for the purpose of rival trading which was not permissible under the Electric Lighting Act. The defendants were not entitled to do one thing or the other under the sections he had cited, because new consumers of light would be obtaining their supply of power at a lower rate. The mere fact that it would pay the defendants to get consumers at the lower rate was not a sufficient reason for discriminating in favour of one against another. They were not entitled to discriminate against a person who was using light without power, because in this way they would get custom which would otherwise go to the Gas Company. If their object was to increase their new customers, they were not entitled to do it by discriminating against their old ones. They had already differentiated between houses and factories; and it was therefore difficult to understand any valid reason that would justify the change which had been made.

Counsel proceeded to deal at length with the authorities, which mostly referred to railway rates, for the purpose of showing that the only thing which justified differentiation was different circumstances which made a difference in the cost of the service rendered.

The further hearing of the case was then adjourned until Monday (yesterday).

A Defective Weighing-Machine.

As the result of having a defective weighing-machine, the Devon Gas Association, of Chudleigh, were, at Newton Abbot, last Tuesday, fined 10s. for failing to have the machine stamped, and 6s. 8d. in respect of each of the weights. An inspector, giving evidence, said the balance of the machine was 1 lb. 6 oz. incorrect; but it was this much in favour of the purchaser. The machine was also wrong in the bearings to the extent of about 1 lb. in favour of the purchaser. The weights were 7 drams and 5 drams light respectively. He did not suggest any fraud. On a ton, the purchaser would gain 60 lbs.

Liability for Burst Water-Mains.

In the "JOURNAL" for the 8th of July last (p. 127), a report was given of an action brought by the Charing Cross, West End, and City Electricity Supply Company, Limited, against the Hydraulic Power Company, to recover the sum of £717 for damages caused to their underground pipes and works through the bursting of the defendants' mains in the neighbourhood of Cannon Street, E.C., on three days in February and one day in August, 1912. The defendants denied that there had been any negligence on their part, and contended that they were not liable, especially as they submitted that the fractures of their mains were caused by subsidences due to the laying of the plaintiffs' cables. The action came before Mr. Justice Scrutton, without a jury; and he found that the defendants' had not been guilty of any negligence. But he gave judgment for the plaintiffs, on the ground that, apart from any question of negligence, the defendants were liable, as they had for their profit brought into the road a dangerous thing—water at very high pressure—which had escaped and thus caused the damage. The defendants appealed, and the case was heard by Lord Sumner, Lord Justice Kennedy, and Mr. Justice Bray last week. Without calling upon Counsel for the plaintiffs, their Lordships unanimously dismissed the appeal. Lord Sumner said the question was whether, in the circumstances, the plaintiffs had suffered injury or an invasion of their rights by a nuisance on the part of the defendants. He thought they had; and, further, he considered that the case was indistinguishable from that of *Fletcher v. Rylands*.

Electrical Breakdown at Neath.—A couple of hours of inconvenience were experienced in Neath last Wednesday—that is, by users of electricity—owing to a breakdown in the supply of current. The postal work was much upset; and we are told that "those hotels which are served by electricity were placed at a great disadvantage."

A Discovery in Gas Lighting.—In the course of a letter to the "Bristol Times," F. B. announces a discovery which it seems strange he has not made before. He says: "After many years I paid a visit to Bath, and the thing which considerably impressed me was the perfect blaze of light which greeted the eye as one strolled through the city. This was chiefly due to the outside lighting of business houses and shops by what I imagined, at first sight, to be an improved electric arc light. But I was greatly surprised on closer inspection to find it was an inverted gas-fitting. The mantle was two or three times the usual size, and the light given was most effective. It is the first time I have noticed this class of light; and I think it would be to the city's advantage if our local Company would introduce it here. It is certainly the best illuminant I have yet seen."

MISCELLANEOUS NEWS.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

Half-Yearly Meeting—The Experts' Investigations—Election of Three English Directors.

The Half-Yearly General Meeting of the Alliance and Dublin Consumers' Gas Company was held on Tuesday last, in the Aberdeen Hall of the Gresham Hotel, Dublin, when there was a large and representative attendance of shareholders. In the absence of Alderman W. F. Cotton, M.P., Chairman, Mr. JOHN MURPHY, the Deputy-Chairman, presided.

The SECRETARY (Mr. Francis T. Cotton) having read the report of the Directors, as given in the "JOURNAL" for March 24, p. 848,

CHAIRMAN'S SPEECH.

The CHAIRMAN said that, before proceeding with the business, he should explain that he occupied his position because of the absence in London of Alderman Cotton, who was detained by his parliamentary duties. He expressed regret at Mr. Cotton not being able to be present, and added that he was authorized to state that, owing to his arduous public engagements, Mr. Cotton would not seek re-election as Chairman of the Company. He next moved the adoption of the report and statement of accounts, and regretted that they were not of a more satisfactory nature. They would observe that there were some alterations in the form of the revenue account now submitted. These alterations, although in no way affecting the result, gave the cost of manufacture more in detail. This was useful for purposes of comparison. They had written-off the balance of the cost of the new retort-houses, £15,082 8s. 5d., against the contingent account and special purposes fund, which sums had been allocated from revenue from time to time for such purposes; so that the item of £2000 which had for some half years past appeared as a charge against revenue now disappeared. The balance to the credit of the contingent account would now stand at £1436 2s. 6d., as shown in the present balance-sheet. During the past half year they had added 1530 new slot installations, fitted in each case with cooker, pendant, and brackets. There were also 116 cookers supplied to houses in which gas had not previously ever been used, 910 cookers and 808 heating-stoves let on hire, and 142 stoves and fires purchased by consumers—making a total of 53,993 cooking, heating, and slot installations in use. Comparing the trading results of the six months ending Dec 31 last with the corresponding period of 1912, the rental showed a slight decrease of £368 9s. 6d. The total receipts for residuals were practically the same as in the corresponding period; and had it not been for the interruption in the manufacture of sulphate of ammonia, the result, as regarded the residuals, would have been satisfactory. On the other side of the account, the cost of production exceeded that of the corresponding period by £15,897, made up as follows: Increased cost of coal, £9908, increased cost of oil, £4901, increase in wages paid at works, £1088. The other items in the revenue account did not call for special remark. There had been a decrease in their sale of gas, largely accounted for by the diminished demand owing to the acute labour disturbances which continued for several months of the period under review. During this time the working of practically all the industries of Dublin city was affected, and thousands of workmen were out of employment and could only partially use their gas. The new sulphate of ammonia plant, which had been previously ordered, should have been delivered in August. Owing to the closing of the port and the suspension of the sailings of all the regular lines of steamers, however, delivery could not be obtained. As a result their manufacture of sulphate came to a standstill. In consequence of what occurred at the last half-yearly general meeting, two gas engineering experts were appointed to examine into and report upon the state of the Company's affairs. The experts selected were Mr. W. Newbigging, of Manchester, and Mr. W. R. Herring, of London, two gentlemen of such recognized ability in their profession that any remarks of his in this regard would be superfluous. They received every assistance from the officials, and were given all information it was in their power to afford. Their joint report was an exhaustive one. It only reached the Directors about the middle of February, and would, of course, receive their fullest consideration. As regarded the proposed increase in the number of Directors, speaking for his colleagues and himself, he wished to say that they quite recognized the very natural anxiety of the stockholders that new members of the Board should be elected by them. The Directors had no desire to interfere in the choice of men—leaving the stockholders to make their own selection. He assured them that they would welcome the assistance of, and gladly co-operate with, the new Directors in endeavouring to promote the interests of the Company. Stockholders who had been in the habit of attending their meetings, would, he was sure, regret the retirement, owing to continued ill-health, of Mr. Charles Lawler. He (Mr. Murphy) had avoided anything of a controversial nature in his remarks, feeling that no good purpose could be served by the introduction of such matter, and that, moreover, any steps it might be considered necessary to take in reference to the experts' report, or in any other way as regarded the future direction of the Company's affairs, were matters to be dealt with by the reconstituted Board. He would be glad to hear any remarks which any stockholder might wish to make, and to give any further information in his power.

Mr. SCALLAN seconded the Chairman's motion.

REMARKS BY SHAREHOLDERS.

Mr. F. J. DICKENS said he had asked the Directors to allow him to make a statement at the opening of the meeting, as he thought that if he now amplified the circular-letters which the shareholders had received from him those present would better understand the position, and might be helped towards arriving at a decision as to the best course of action when the questions referred to came up for discussion. At the outset, he wished to state that he was going to speak out openly and frankly, and that what he had to say was not said in any offensive or acrimonious spirit. First of all, he took them back to his letter of Sept. 27, 1913, and he desired to make a slight correction. In the comparison which he then made between Dublin and Belfast, as to the cost of coal and working expenses, the words "less residuals" should not appear. He had not noticed the slip until Mr. Stevenson, of London, pointed it out to him. The circular-letter in question was put together very hurriedly. As a matter of fact, he wrote it in the train between Holyhead and Manchester, on his way back from Dublin after his first interview with the Directors; and the error crept in in a very simple way. He had prepared two sets of figures—one with the residuals included, and one with them deducted. It was his intention to give the second set of figures. On consideration, however, he thought the first set would make a clearer impression on the lay mind; so he altered his circular accordingly, but inadvertently allowed the words "less residuals" to remain. He wished to have this matter made clear. The next point in reference to the circular-letter that he wished to touch upon was his allusion to Mr. H. E. Jones as the Consulting Engineer of the Company. It was only quite recently that he learned that Mr. Jones was only called in casually when the Board wished to consult him on any particular question. The circular recently issued by the Committee of London shareholders stated that even then his recommendations were not always carried out. However that might be, he wanted now to say that it was never his intention to make any reflection upon Mr. Jones professionally; and he was sorry if any such impression was conveyed to the shareholders. He took this, the first opportunity, of making honourable amends, if any were required; and he hoped the shareholders now understood exactly the past relations of Mr. Jones to the Company. Having cleared up these two points, he wished to refer to his letter of March 16—not issued until March 20. He kept the letter back for a few days, as he deemed it advisable that shareholders should receive the Directors' report and his letter by the same post. He explained therein how the position had changed since he made the promise to let the shareholders have a copy of Mr. Newbigging's report when he received it. They must remember that at the time he wrote them the question of having a second expert had never been mooted. It was only at the shareholders' meeting a few days later that the Chairman made the suggestion. He (Mr. Dickens) had been criticized by some shareholders for accepting the suggestion as to a joint inquiry. But he looked at it in this way: Supposing that he declined to accede, and the Board appointed an expert to make a separate inquiry, they would then have had two separate reports—one on behalf of the Board and one on behalf of the shareholders. Supposing the two reports were conflicting—for even experts, like doctors, could disagree—they would then have stood that day at this meeting just as they stood six months ago, except that they would have lost so much time. He had been criticized also for allowing the Board to pay the fees and expenses of the expert he nominated, and thereby, as one of the shareholders wrote to him, allowed himself "to be muzzled." But he only agreed to the inquiry being a joint one, and to the cost of the inquiry being borne by the Company, after very careful deliberation and consultation with his friend, Mr. W. H. Davies, who, he might say, had done yeoman service in the past six months on behalf of the shareholders. The view Mr. Davies and he took was—and he thought the results justified it—that if the experts were able to arrive at a common agreement and sign the report jointly, then, if it was adverse, there could be no possible ground of excuse or justification for the present state of the Company's affairs, as their own experts had compiled it. They did, however, safeguard the situation by stipulating that Mr. Newbigging was to be quite at liberty to sign an independent report if he thought fit. He wished here to add that Mr. Davies and he strongly opposed the appointment of Mr. Herring as expert, and submitted other names, which the Board declined. Their objection to Mr. Herring was not on account of his qualifications—those were beyond any doubt—but because they were given to understand, rightly or wrongly, that his relations with the Board and the management were of the friendliest nature; and they did not wish to place him in a difficult and somewhat delicate position when pronouncing a verdict. Further, it was said that at the gas undertakings at Edinburgh and Huddersfield, with which Mr. Herring had been previously connected, the capital cost per 1000 feet of gas was relatively high, and they felt that if figures from these undertakings were used for a basis of comparison at Dublin they would hardly be a fair standard.

THE EXPERTS' REPORT.

Regarding the publication of the report, apparently many shareholders differed from his opinion that it was not in the best interests of the Company that it should be distributed broadcast. Well, he had seen the report and had considered it carefully; and this was his honest opinion. It could certainly do no good to have the affairs of the Company discussed and bandied about in the public Press, as would inevitably happen; and it might do a vast amount of harm. There was nothing to be gained by—to use a phrase—"washing dirty linen in public"; and in coming to this decision he did so simply from the point of view of the shareholder. While on this question, he wished to refer to the article which appeared in the March 24 issue of the "JOURNAL OF GAS LIGHTING," where the writer said "the Directors now claim that no one has the right to circulate the report without the authority of the Board." This was untrue. He had written to the Editor pointing out that, in common fairness, he ought to give the full context of the sentence, and not omit the second half, which read "or a resolution passed by the shareholders in general meeting calling for it to be circulated." He would also suggest that, as there was great anxiety in the minds of some shareholders who were unable to be present, a report of this meeting should be printed and circulated. He apologized for troubling the meeting at such length; but he was very anxious to clear the atmosphere as well as he could, prior to any discussion that might take place.

LANCASHIRE AND RE-CONSTITUTED BOARD.

There was a good deal said to the effect that the Lancashire shareholders were attempting to dominate the situation. This was not so however. The reason that all the negotiations had been carried on

through the Lancashire Committee was that it was the only one in the field. Until a fortnight ago, shareholders in either Scotland or London had not bestirred themselves in the matter. He had been criticized for not co-operating with the Edinburgh and London Committees. In reply, he wished to say that the Lancashire Committee would have cordially welcomed their co-operation last September; but to rush in at the eleventh hour, when all plans were matured, and ask them to upset them, was, he would maintain, not reasonable, especially as the burden and heat of the fight had been borne by Lancashire. He also wished to emphasize the fact that, though the nominations of the new Directors had been made through the Lancashire Committee, they were representative of shareholders all over the United Kingdom. Mr. Bond had been nominated by one of the leading Irish shareholders and seconded by a very large holder in Lancashire. Mr. Davies was nominated by the largest holder in the West of England, and seconded by the principal shareholder in Wales, and his (Mr. Dickens's) own nomination proceeded from one of the best known insurance companies in London, who held a big stake in the Company, and was seconded by one of the most influential shareholders in Scotland. These nominations were now in the Secretary's hands. He asked them could they have any more representatives.

QUESTION OF EXPERT AS DIRECTOR.

As to the burning question of placing an expert on the Board, Mr. Dickens explained his attitude on the matter and why he was opposed to it. He admitted that, at the first glance, the idea was alluring and calculated to capture the man in the street. But it had, in his opinion, very serious drawbacks. Supposing they appointed such an expert, what would happen? If the expert was a strong man he would dominate the whole Board, and the policy of the directorate would, in time, become simply a one-man policy. Was not this a menace? Would not the Board become in time the servant of the expert, or, if it did not, would there be harmonious working? Would there not be constant acrimonious discussion, and subsequent dissension? Was it not often the case that the expert spent much of his time falling out with the engineer or *vice-versâ*, and did this make for smooth working? Again, how many experts possessed the necessary commercial and financial experience and the faculty of organization which were so urgently needed now, and which would be required to deal with the most pressing reforms that had to be instituted and the economies that had to be effected? One of the largest shareholders, in sending him (Mr. Dickens) his proxy, referring to this point, said: "What we want are dividend-earners, not money spenders." [Applause.] It was a rather sweeping remark; but, at the same time, there was a modicum of truth in it, as they would find on examining the records of some undertakings controlled by experts, where the capital cost per 1000 feet of gas had increased during their reign. But he asked them not to think that he wanted to convey that the expert who possessed commercial experience and the faculty of organization and economical management was unknown, or even a *rara avis*. On the contrary, he acknowledged there were many who possessed all these qualities. What he maintained was that the best working combination would be found in a Board of good business men, with financial and commercial experience and the average amount of commercial acumen, fortified by a good resident engineer, and an expert as consultant, to be called in when required. [Applause.]

A PERSONAL MATTER.

In conclusion, Mr. Dickens referred to what was in a sense a personal matter. He meant the circular issued by Messrs. Watson, Forrest, and Watt, stockbrokers, of Edinburgh, on March 11, which gave the tenor, or, at all events, a forecast of the tenor, of the experts' report. This circular placed Mr. Davies and himself and the Directors in a very false position, as they had been accused of having given prior information as to the character of the experts' report to the Edinburgh shareholders. He wished to state now, on his word of honour, that he had never given the slightest hint, in any shape or form, as to what the report contained, prior to the circular-letter sent out on March 20; and Mr. Davies and the Board had, he knew, kept their lips religiously sealed on the subject. It was due to himself, to his colleague, Mr. Davies, and to the Board, that he should publicly make this disclaimer.

GROUNDS FOR DISSATISFACTION.

Mr. R. W. EDWARDS (Aldershot) said he had no amendment at that moment to propose; but he thought the report of the experts should be properly considered, and that, in relation to it, a Committee of shareholders should be allowed to see it, and afterwards confer with the Board. It appeared to him that the Company were not keeping step with modern requirements. The capital expenditure per 1000 cubic feet of gas sold, instead of being on the down-grade, was greater to-day than it was twenty years ago. Whereas in 1894 the capital employed represented 16s. 9d. per 1000 cubic feet of gas sold, in the year 1912 it had risen to 18s. 5d. Of course, high capital expenditure meant a proportionately higher dividend cost—a feature pregnant with possibilities of future recuperation. Furthermore, it would be seen that the consumer suffered from the existing state of affairs, when it was realized that, for a 5 per cent. dividend the very high charge of 1s. 3·35d. per 1000 cubic feet of gas must be levied to meet capital requirements. As the last and cruellest cut of all, with this prodigious levy, there was still a shortage of 7s. 6d. per cent. due under the sliding-scale—resulting in an annual loss to stockholders of £5820. Such a state of affairs showed a grave leakage somewhere; and as the statement was based on the 1912 figures, no cry of a bad year such as 1913 could be raised. Contrast this position of affairs with that of other undertakings. Excluding the Metropolitan and Suburban companies, he found that the Provincial gas companies met their capital requirements with a rate of 6·74d. per 1000 cubic feet, as against the 1s. 3·35d. of Dublin. This was a difference of nearly 9d. per 1000 cubic feet; and even at that, full dividends would not be available. Surely this was an astounding contrast, revealing a state of management requiring the fullest investigation. Turning for a moment to the revenue side, and again adopting 1912, he would take Belfast, which was the only other city in Ireland of comparable size. How did the two compare? In Dublin, for 1912, the total cost of gas, including distribution and management charges, and less residuals, was 25·04d. per 1000 cubic feet sold. In Belfast, for the same year, the figure was 13·47d.—a difference in favour of the Northern town of 11·57d. per 1000 cubic feet. It seemed impossible. But there it was. To heighten the effect of these figures, the standard of quality of the gas in Belfast was higher than that obtaining in Dublin. Even so, if Dublin could manufacture and distribute its gas at the same cost as Belfast, on the basis of the 1912 sales, it would mean increased profits to the extent of some £70,553. Put the two points he had brought out together. On the one hand, capital expense in the region of 9d. above that of the average British provincial companies; and, on the other hand, running costs (say) 1s. above those of Belfast—where the undertaking was a municipal one, and a higher quality of gas was enforced. The remarkable result was arrived at that Dublin came out on the wrong side to the tune of over 1s. 8d. per 1000 feet. What a glorious field there was here for economies! Taking the 1912 price of gas—*i.e.*, 3s. 4d. per 1000 feet—the saving would represent a 50 per cent. reduction. He had no hesitation in saying it was well within the range of possibility to within seven years reduce the price of gas in Dublin to 2s. 6d. Gas sales would go up by leaps and bounds with improved and cheapened service, and the capital ratio would be reduced. Dividends under the sliding-scale, with gas at 2s. 6d., would be at the rate of 6⅝ per cent. The introduction of co-partnership, too, would increase the wages of the workers. The point now was, in his opinion, whether or not one of the vacancies on the Board should be filled by the appointment of a man who had a knowledge of the business, and ability to apply it. What was wanted, in fact, was good administration on business lines by some one who appreciated the value of the Company and of their undertaking.

SCOTTISH SHAREHOLDERS.

Mr. JAMES WATT, W.S., of Edinburgh, speaking on behalf of the Scottish Shareholders' Committee, said that it was unfair to suggest a belated interest on their part, and that it was only within the last week or two, when the Lancashire Committee had departed from the pure claim for reform, and had arrogated to itself the right to nominate the whole three vacancies on the Board, that intervention had become necessary. This right was now claimed by Mr. Dickens not as the best course, but because Lancashire had borne the "burden and heat of the fight." The form of administration which had hitherto failed was to be continued—a Board, without any expert knowledge, who would call in a consultant when wanted. He (Mr. Watt) urged that it was of the first importance to have a member of the Board who, from expert knowledge, would understand and explain to his colleagues any reports by experts brought before them. A consultant only called in occasionally was wrong. Mr. Jones was said to have occupied such a position; and he had explained that his recommendations had at times been ignored. He (Mr. Watt) stated that the only course open to an expert treated in this way was to resign, and it was understood that Mr. Jones had resigned recently, and not at the request of the Directors. Mr. Jones must himself have considered the circumstances called for his resignation. Alluding to the joint report, he (Mr. Watt) pointed out that Mr. Dickens had omitted to give Mr. Herring credit for his part in it, and specially that although Mr. Newbigging was entitled to sign an independent report, he had not found it necessary to add a single word—a result which was more especially remarkable, seeing that the report was such as Mr. Dickens thought should not be circulated. He (the speaker) warned the present meeting that the scheme for the reconstruction of the Board was for merely perpetuating the old and bad system; that in any event the consultant engineer ought to have continuous and not intermittent responsibility; and he claimed that, while Mr. Dickens was understood to have the control of the situation by the proxies he held, these proxies were given in favour of reform as a principle and not to enable him to dictate the continuance of the old method of management. In conclusion, he (Mr. Watt) stated that he would use the proxies he held in favour of the appointment of Mr. Herring as a Director—a gentleman who, by his report, had shown his ability to take up an independent position, and as a protest against the domination of the new appointments by Lancashire naming three gentlemen, all of whom were without expert knowledge.

AN IRISH GAS MANAGER'S PROTEST.

Mr. JOHN LYNE (Wexford) argued that, apart from the large capital involved, the Company should have made a profit just as well as Belfast, and on sound lines. It was not in the matter of capital that the shoe pinched, but in the working of the concern.

LONDON SHAREHOLDERS' ADVICE.

Mr. R. L. ANDREWS deprecated comparisons with Belfast. There was no use talking about the past. They were living in the present. He was a large shareholder in other gas undertakings; and it was a great distress to him to find the Dublin Company in a different position from that held by companies in London. The dividends proved to him and others that the working of the undertaking was not efficient, and not what it ought to be. But they need not waste time discussing what had happened or going into matters that were past and gone. It was the common object of the shareholders to put the best Directors possible on the Board; and he urged that they should proceed to do so. When they had good men on the Board—men capable of dealing with the Company's affairs—all would be well.

THE BOARD'S TRYING TIMES.

Mr. W. H. DAVIES (Blackburn) said he thought that criticism of the report was justified; but he would remind shareholders that the Board had had trying times during the past six months. Mr. Dickens said he had occasion to visit Dublin during that period, and they had some inside knowledge of what was going on. He could personally testify to the great stress and anxiety which the members of the Board had gone through, and to the responsibility that rested upon them during the dark winter months in the period of the labour troubles in Dublin. He was of opinion that gratitude was due to the Board for the unremitting attention, energy, and perseverance which had enabled them to keep up the supply of gas during that anxious time. [Hear, hear.] He had no doubt that if the recommendations of the experts were closely considered and carried out, the undertaking could be brought

round. This was no time to ask for additional capital. It was not required. They from Lancashire had, he assured the meeting, no axe to grind. What they wanted to do was to preserve and protect capital. His concern's interest amounted to £25,000. Mr. Dickens and his friends were interested to about an equal amount. The position as it stood had been forced on them; and they were bound to do what they could in the interest not only of themselves but of the other shareholders—the general body. He felt that they could not consistently with duty have done otherwise than they had done. If they were elected to the Board they would do their utmost to further the general interests and to bring prosperity to the Company.

Mr. W. R. MORLAND (Gloucester) criticized the administration as to gas sales in 1912 as compared with those in 1904.

Mr. DAVIDSON said the question he should like to have answered was, Who was to blame for the present condition of the Company? The report gave them no information, and no idea had been conveyed otherwise as to where the responsibility lay. They should, he thought, be told whether it was the Directors or the officials who were to be held blameworthy.

THE CHAIRMAN'S REPLY.

The CHAIRMAN said the answer to Mr. Davison was that the question was, like other points that had been raised there, one that had been raised in the report of the experts. All these matters would have to be considered by the new Board. He wished to mention that the income-tax was paid in one sum annually, and not half yearly. As to the capital, the fact of the matter was that for some years past the Company had lost a great number of their consumers. Some £400,000 had been spent on the slot system, which had now been written-down to £200,000.

The report and statement of accounts were then adopted.

THE DIVIDEND.

On the motion of the CHAIRMAN, seconded by Mr. J. E. FOTTRELL, a dividend at the rate of 2½ per cent. on the consolidated ordinary stock of the Company was declared.

INCREASED DIRECTORATE.

The CHAIRMAN then moved that the number of Directors be fixed at eight.

Mr. TRESILIAN seconded the motion.

Mr. EDWARDS moved, as an amendment, that the meeting stand adjourned for a month; that six stockholders be appointed to co-operate with the Lancashire Committee for the purpose (*a*) of investigating the position as to additional Directors, and (*b*) to consider the experts' report, and to report to the shareholders and submit recommendations. He held that the meeting had no power to increase the number of Directors from six to eight. He had Counsel's opinion, which he now produced, to show that this was so.

The CHAIRMAN: So have we. We propose to fix the number at eight.

Mr. EDWARDS said the opinion he held was an interpretation of the Company's own Act of Parliament.

Mr. LYNE seconded the amendment, which was declared rejected.

Mr. EDWARDS asked for a poll, but

The CHAIRMAN said that would entail a lot of trouble, and would be useless, as it was clear that the amendment would be defeated.

Several shareholders agreed with the Chairman that it would be a needless loss of time to have a poll.

Mr. EDWARDS said, in the circumstances, and after what the Chairman had said, he would not press for a poll.

The CHAIRMAN'S motion was then adopted.

THE NEW DIRECTORS.

Mr. BOUSCHILL moved the election of Mr. Dickens as a Director in room of Mr. Charles Lawler, retired. This having been seconded,

Mr. NELSON, Waterford, proposed, and Mr. SPARROW, London, seconded, Mr. R. Bruce Anderson for the vacancy.

Mr. SPARROW availed himself of the opportunity to disclaim any intention of London shareholders to act disrespectfully towards the Lancashire Committee. They only acted, he said, when they got the report.

Mr. R. B. ANDERSON said if he were elected the shareholders might be assured that he would always have their interests at heart.

On a show of hands, Mr. Dickens was elected.

Mr. R. L. ANDREWS proposed the election of Mr. W. H. Davies to the directorate.

Mr. R. MEAGHER seconded; and the motion was agreed to.

Mr. ASHURST GRADWELL moved the election of Mr. Augustus Bond, of Chorley, Lancashire, to the directorate.

Professor PURCELL seconded.

Mr. WATT moved, as an amendment, that Mr. Herring be elected, and Mr. EDWARDS seconded the motion.

Upon a show of hands, eighteen voted for the appointment of Mr. Herring, and twenty (including two of the Directors) for the appointment of Mr. Bond. Mr. Bond was therefore declared elected.

Mr. BOND, returning thanks, alluded to the great possibilities of the undertaking, and assured the shareholders that he would do his best, with his fellow-Directors, to serve their interests. He was confident that they would have no difficulty in dealing with affairs in a manner which would enable them to show good results in twelve months' time. At all events, he added, they would do their best.

Mr. FRANCIS M'BRIDE was reappointed Auditor.

A vote of thanks to the Chairman and the Directors was then passed, and acknowledged by Mr. Murphy.

The CHAIRMAN subsequently read the following figures, which had been asked for by Mr. Edwards and others:—

	Votes.	Proxies.
Mr. Dickens and others, £409,063 . .	14,814 ..	872
Messrs. Watts and Watkin, £144,422 .	4,769 ..	299
Mr. Wilson and others, £138,470 . .	5,076 ..	333
Directors, £58,827	2,128 ..	149

Extraordinary Meeting.

THE COMPANY'S ELECTRICITY SUPPLY BILL.

Subsequently, an extraordinary meeting of the Company was held at the chief offices in D'Olier Street for the purpose of considering the provisions of the Bill promoted by the Company in the present session of Parliament to authorize the Company to supply electricity within the districts of Blackrock, Kingstown, and Dalkey, and for other purposes.

Mr. MURPHY, the Deputy-Chairman, who presided, said the meeting had been summoned in accordance with the Standing Orders of the House of Commons. The Company had gas-works at Kingstown from which Kingstown, Blackrock, and Dalkey were supplied with gas at the present time. There was no supply of electricity in these areas; the local authorities not having made use of the powers granted them by Parliament. The Board were following the example of several gas undertakings which had already obtained powers for the supply of electricity in their areas; being of the opinion that if there was a demand for electricity it was better that the gas undertaking should enjoy whatever benefit was to be derived from it than leave it to others. As already stated, they had works at Kingstown, where they had ample land for the erection of the necessary machinery. They had already sufficient plant for the production of producer gas to drive the engines. They were, therefore, in a better position to generate current at a low rate than any of the local authorities in the districts. Last session a Provisional Order was promoted by the Dublin and Southern District Electric Supply Company. It passed the House of Lords, and, by a resolution of the House of Commons, would be proceeded with further this session. It related only to Kingstown. It was opposed by this Company, who offered to bring forward a comprehensive scheme this session for the lighting of Kingstown, Blackrock, and Dalkey. At that time they had good reason to hope for support from Blackrock and Dalkey, and that Kingstown would at least remain neutral as between them and the Dublin Southern District Company. The situation, however, had somewhat changed since the introduction of the Gas Company's Bill. At the recent election of the Kingstown Council the constitution of the Council was considerably altered, and they had decided to oppose the Dublin Southern District Electric Company's as well as the Gas Company's Bills. Blackrock and Dalkey had also lodged petitions in opposition to them, as they now said they themselves desired to undertake the supply of electricity within their several districts, though they did nothing when they previously had powers; and they had now no Provisional Order or Bill before Parliament. The Board were not without hopes, however, that they might be able to come to an agreement with the local authorities. He would, therefore, ask the shareholders to sanction their proceeding with the Bill, in which event the Board would, of course, be guided by circumstances, and would do whatever appeared best in the shareholders' interests.

Mr. FITZGERALD, Law Agent, then explained the several clauses of the Bill.

Mr. G. W. NORMAN (Dublin) proposed, and Professor PURCELL seconded, a motion approving of the Bill, and authorizing the Directors to proceed with it.

This was passed; and the meeting terminated.

Mr. JOHN LYNE (Wexford), the notes of whose speech as printed in the "Irish Times" were substantially as given above, has since written to our Irish contemporary that what he said was: "The present price of gas in Dublin is actually 1s. 9d. per 1000 cubic feet more than in Belfast; and for the year ended Dec. 31 last it was 1s. 7d. per 1000 cubic feet. Belfast made at least a profit of 2d. per 1000 cubic feet on gas sold at 1s. 9d. In fact, they could not have got on without making much more than this. Taking 2d., and adding it to the 1s. 7d., would show that the Dublin Company, if it was worked as much to advantage as Belfast, should have made a profit of at least 1s. 9d. per 1000 cubic feet of gas sold. The actual quantity sold in Dublin for the half year ended Dec. 31, 1913, was 726,612 thousands. Multiplying the 726,612 thousands by 1s. 9d. gives £63,578, as against £32,591, shown in the revenue account as profit. The £63,578 would have yielded not only a handsome dividend on the excessive capital, but would leave a large sum to be carried to the reserve fund." His further comment is as follows: The strike in Dublin was called on to account for some of the loss; but the cost of coal, oil, and all gas-producing materials, per 1000 cubic feet sold, during the half year ended Dec. 31, 1913, only exceeded the cost of the same materials used in the previous half year by 0·87d. per 1000 cubic feet of gas sold; and that was the item in the accounts which would chiefly have been affected by the strike. I called attention to some other matters which were of importance; but I do not think it necessary to refer to them now. One thing, much to my astonishment, was revealed at the meeting; and that is, that, so far as shareholders are concerned, the Dublin Gas Company is now chiefly a Lancashire company. Three Lancashire men were placed on the Board; and the proxies for them were so numerous that the other proxies were snowed-under. It is to be hoped that not only the shareholders, but the gas consumers, will derive advantage from the change that has been made in the directorate.

ELECTION OF CHAIRMAN.

We understand that, at a meeting of the new Board of Directors on Wednesday last, Mr. John Murphy was elected Chairman of the Company.

Macclesfield Gas-Works Extensions.—The Macclesfield Town Council have passed without comment minutes of the Gas Committee which recorded the adoption of a scheme involving the taking down of three cottages, the provision of a new weighbridge, and a steam-boiler in the retort-house, together with larger exhausting plant, and entailing a total expenditure of £1750.

LANARKSHIRE GAS ORDER.

The Lanarkshire Gas Order was duly before the Commissioners last Friday, when the preamble was proved and clauses adjusted. As was intimated some while back, there was opposition from the burgh of Motherwell and from the Carfin, Cleland, and Newarthill Gas Company. The first opposition had been settled some time since by the insertion of a clause safeguarding their interests. The Gas Company and the County Council had only recently come to terms; and when the proceedings opened Mr. Macmillan, K.C., appeared for the burgh of Motherwell and objected to the clause which had been agreed upon with the Gas Company. He pointed out that a small part of the Company's undertaking was included in the burgh of Motherwell, and that it might be held, when the question came to be settled in the Law Courts, that the Motherwell Town Council would have to acquire not only their portion of the Carfin undertaking which was within the burgh, but also the much larger part which was outside the burgh. They accordingly thought that if this occurred the County Council should be bound to buy from them in the same way as they were prepared to buy from the Carfin Company.

Sir Thomas Munro, the County Clerk of Lanarkshire, stated, in reply to Sheriff John Wilson, K.C. (for the promoters), that the Council were already protected by the general law, as they had statutory powers. The Order did not propose in any way to alter the general law affecting burghs. In cross-examination by Mr. Macmillan, he admitted that if the County Council chose they could, under the Order, start gas operations and compete with the burgh of Motherwell, assuming that the burgh were not protected under the Act of 1876. But resolutions by the District Committee and also the County Council must first be passed. Also any ratepayer had the right to object and appeal to the Sheriff. He could not conceive any Sheriff allowing a local authority to do an unreasonable thing, in face of opposition.

Two adjournments were necessary to adjust the clause to be agreed on between parties. In the end it was provided that, if the burgh of Motherwell acquired the whole undertaking, in no event were the county to acquire the portion within the burgh. Thus, in the event of the County Council being bound to acquire the portion within their jurisdiction, in the determination of the price they were to pay there should not be taken into account any part of the expenses of the arbitration which would have to be entered into between Motherwell and the Carfin Company for the acquisition of the latter's undertaking. This was to avoid paying double expenses on the two transfers. The last point was that during the time the Motherwell burgh carried on the undertaking, before the county actually came to acquire it, they should supply gas to the county's reasonable satisfaction at a reasonable price; any question between the county and the burgh to be left to the Sheriff for determination.

The point raised by Mr. Macmillan, as to how much of the Company's undertaking will have to be acquired by the burgh of Motherwell, is an interesting one, which will probably require the aid of the law before it is finally decided. In any case the Carfin Company seem likely to come well out of the matter; and their opposition to the Order has put them in a very sound position.

Sale of Stocks and Shares.

Messrs. A. & W. Richards sold by auction at the Mart, Tokenhouse Yard, E.C., last Tuesday, stocks and shares in various gas companies. A new issue of £7500 of ordinary stock in the Sutton Gas Company was disposed of at from £112 to £117 10s. per £100. The stock ranks for a standard dividend of 5 per cent., subject to the sliding-scale, equally with the Company's existing similar stock, now receiving dividend at the rate of 6 per cent. per annum. In the Rochester, Chatham, and Gillingham Gas Company there was also a new issue of £7500 of consolidated ordinary stock; and this realized from £100 to £102 10s. It ranks for a standard dividend of 5 per cent., subject to the sliding-scale, equally with the existing similar stock of the Company, on which a dividend at the rate of £5 2s. 6d. per cent. per annum is now being paid. Twenty £25 fully-paid "D" shares in the Dorking Gas Company (receiving a maximum dividend of 5 per cent.) were sold at from £23 to £23 10s. each; and £1200 of consolidated ordinary stock in the Aylesbury Gas Company (on which a standard dividend of 5 per cent., subject to the sliding-scale, is being paid) fetched £92 per £100.—Mr. J. H. Palmer, on Thursday, sold by auction locally £10,000 of new 5 per cent. maximum ordinary stock in the Weston-super-Mare Gas Company, made on account of the rebuilding of the works, which is being done under the advice and guidance of Sir Corbet Woodall. As soon as the new plant is in operation it is anticipated that considerable economies will be effected in every branch. The approximate total cost of the new works will be about £40,000; and up to the present the Directors have entered into contracts amounting to £28,486. A sum of £8750 has already been paid; and there remains a balance of £19,736 to be raised. The present issue was on account of this amount. The stock was offered in £50 lots, a number of which were sold at prices ranging from £57 10s. to £52. Some lots were undisposed of, as the Directors refused to sell at less than the last-named figure.

Belfast Gas Undertaking.—At a meeting of the Belfast Corporation last Wednesday, Alderman Craig, in moving the adoption of the Gas Committee's minutes, said the Committee had saved from last year over £2500. They recommended the acceptance of the tender of Messrs. J. & W. Stewart for the erection of a reinforced concrete bridge over the River Blackstaff. Mr. Gilliland moved the deletion of the minute relating to this contract, on the ground that the tender was not in accordance with specifications sent out to contractors; but the amendment was lost by 13 to 8 votes, and the minute was adopted, subject to the Town Solicitor advising that the tender was legal. The Manager (Mr. J. D. Smith) reported an increase in the gas output for the year ended March 31 of 47,877,000 cubic feet over the amount for the previous year.

BRITISH COMMERCIAL GAS ASSOCIATION.

A Glasgow Conference.

The occasion of the presence of so many gas managers in Glasgow last Wednesday—in connection with the "Informal Meeting" reported elsewhere—was taken advantage of by the British Commercial Gas Association for the holding of a conference in the earlier part of the day, in the Municipal Buildings. Bailie PAXTON, the President, was in the chair; and there was a large attendance, including many members of the Town Council.

The CHAIRMAN indicated that the meeting had been called for the purpose of conferring with those who were interested in the usefulness of the British Commercial Gas Association, which existed for the greater development of the gas industry of Great Britain and Ireland. Started in 1911, the Association had proved itself a live organization, and had made remarkable progress in all directions. It was engaged in the education of people in the proper use of gas for all purposes. By advertising, lecturing, demonstrating, and other methods, it sought to bring home forcibly to the people the necessity of using up-to-date appliances, if cleanliness, comfort, and good health were to be considered. The increase in the output of gas since 1911 had been enormous; and statutory companies and corporations were delighted with the financial results of the efforts of the Association. It was true that many people asked why gas was not becoming cheaper. The answer was not very far to seek. Coal had gone up very much in price, and wages had also been increased—so much so that since 1911 the increased expenditure on the production of 1000 cubic feet of gas had been about 4½d. in Glasgow; and, notwithstanding, the Corporation had been able to keep the price of gas the same as before—1s. 11d. for domestic purposes and a much lower price for industrial purposes. He felt very strongly that the real objective in the Association's crusade was not financial gain, but the bringing about of purer air, and consequent better health. Having been long identified with public work, and particularly in the direction of air purification, and the improvement of the housing of the people, he (Bailie Paxton) had no hesitation in placing air purification first; and he would strongly urge those present who had not already done so to at once become subscribers to the beneficent work carried on by the British Commercial Gas Association, the destinies of which were guided by the master-mind of Mr. F. W. Goodenough, of the Gas Light and Coke Company, London, who was the Chairman of the Executive Committee. They had Mr. Mason, the Secretary of the Association, with them. He had been trained in Glasgow, under the late Mr. William Foulis and Mr. Alex. Wilson (their present Engineer), and was fulfilling the arduous and exacting duties of his office to the entire satisfaction of those who were placed in authority over him.

Mr. W. M. MASON gave some interesting facts and figures relative to the remarkable progress of the Association. Although they had only been about two years in existence, they now represented something like 80 per cent. of the gas industry. Their list of subscribers had gradually increased, and those who had looked with little enthusiasm at their efforts during the first year were now whole-hearted supporters. He quoted a number of large undertakings who had at first contributed on a limited basis, but were now subscribing fully. The commercial side of the industry required, he said, to be developed as steadily and carefully as the technical side had been. The great bulk of the cash contributed was expended in advertising in every class of newspapers, and professional or trade mediums; and the results already obtained were admittedly very encouraging. The Association were also educating the public as to the various uses of gas by means of literature; and the service in this connection now at the disposal of subscribers was so appreciated that about three million copies of pamphlets, &c., had been distributed. Much valuable research work had been, and was being, carried on behind the scenes, the fruits of which would be of enormous value to the industry.

Lord Provost STEVENSON—referring to the famous utterance of His Majesty, when Prince of Wales, on his return from his tour round the world: "Britons, wake up!"—remarked that it had caused a great many institutions which were more or less, he did not like to say fossilized, but they were trending in that direction, to really wake up and adopt more businesslike methods of carrying on their work. He thought it wonderful that all gas undertakings in the country had not availed themselves of the opportunities provided by the British Commercial Gas Association. Instead of having to think-out and to compile the advertising material for themselves, they had only to apply to a centre where the thinking-out process had already been done for them by experts. Something like £900 a year was contributed by Glasgow under the scheme for advertising. This looked terribly extravagant; but it was profitable for them to do so. He further said that this interest in the question was largely an interest in smoke abatement, in the purification of the air. His experience in regard to the use of gas appliances was that their worst opponents would be found in their own households. Their womenfolk had to be convinced by them that it was to the advantage of the country that gas-fires and gas appliances should be used; and he did not think they had a better way of doing this than by scattering broadcast the admirable literature referred to by Mr. Mason.

Bailie IRWIN, the Convener of the Glasgow Corporation Gas Committee, in a speech strongly urging the merits of the body, moved that Scottish gas managers should do all in their power to further the objects of the British Commercial Gas Association by becoming subscribers and taking all other means to increase the interest of gas manufacturing undertakings.

Bailie LINDSAY, representing the Edinburgh and Leith Gas Commissioners, emphasized the necessity for more progressive methods being adopted. They had found this necessary in Edinburgh; and although at first they had only partially supported the Association, they had been so convinced of the good work it was doing, and the help it could afford, that they had now agreed to contribute on the full basis. He supported the Association, not only because it helped gas

sales, but because it was also doing much in aid of health by assisting to educate public opinion regarding the smoke problem.

Mr. J. W. NAPIER (Alloa) thought that more might be done to study local conditions.

Mr. MASON explained that for this very purpose district conferences had been inaugurated, and were proving most successful.

Councillor TURNER asked if it was the case that their Corporation were providing means for benefiting surrounding gas companies.

Mr. MASON explained that this point of view was hardly fair, seeing that the largest contributor to the Association was a gas company, and not a corporation.

Bailie DRUMMOND (Sub-Convener of the Glasgow Gas Committee) strongly advocated systematic and general advertising.

The motion was carried, and the Chairman was thanked for presiding.

ALL CONTINUOUS VERTICAL RETORTS FOR ST. HELENS.

The following minutes, according to a local paper, were submitted and passed at the meeting of the St. Helens Town Council last Wednesday. The Gas Engineer [Mr. Samuel Glover] submitted a report on the question of completing the extension of a new set of four purifiers, exhausters, and condensers, with all valves and connections, and a station-meter to deal with the increased make of gas, and also replacing the existing horizontal retorts by 64 continuous vertical retorts on the Glover-West system, with coal-handling plant, coke-extractors, and engines complete, and alterations to house, together with plans and an estimate of the cost; and instructions were given to the Town Clerk and the Gas Engineer to report further on the matter.

The Committee, at a subsequent meeting, again considered the report of the Gas Engineer on the question; and it was resolved that the Gas Committee be recommended to approve of the scheme of extensions as set out in the report of the Gas Engineer and the plans now submitted, and to apply to the Local Government Board for sanction to borrow £42,191, the estimated cost of carrying out the whole of the works.

In moving the adoption of the minutes, Alderman Crooks said the additional capital which the Committee sought power to raise was required for the purpose of completing the extensions of plant at the gas-works which the Committee decided upon some six years ago, by means of vertical retorts, which had now been at work sufficiently long to give the Committee every confidence. The demand for gas was becoming greater every year. The increase during the last working year had been upwards of 32 million cubic feet, making the last year's total production 555 million cubic feet, which was five-and-a-half times as much as the make was when the Corporation took over the works in 1875. Before the last extensions were commenced the works were not capable of producing, with any margin of safety, 2 million cubic feet of gas per day. When the proposed works were completed they would be capable of producing 3½ million cubic feet of gas per day. The present horizontal retort-house apparatus was worn out and obsolete, and must be reconstructed to enable the Committee to meet the ever-growing demands, especially in view of new districts springing up. When installed, the new gas-making plant would bring about efficiencies and economies which would in themselves provide the redemption of the capital expended, in addition to the usual interest charges.

TIPTON GAS UNDERTAKING.

The New Plant.

An interesting report concerning the new plant at the Tipton Gas-Works has been prepared by the Chairman of the District Council (Mr. W. Robbins). It states that the plant (on the Glover-West system) is in thorough working order, and furnishing "good, sound, solid-bodied gas." It is over 15-candle power, and the supply is better than they could find anywhere in the district—Birmingham not excepted.

Comparing the present position of gas with what it was some years ago, the return is very interesting. It states that in 1902 there were 2600 meters, against 5047 to-day; while the gas-stoves number 1193, compared with 120 twelve years ago. The coal carbonized at the works is 13,000 tons, against 9700 tons.

The Manager (Mr. S. O. Stephenson) has also issued a report, in which he says: "The consumption of gas continues to increase. The competition from electricity is going to be much keener, and to meet it we must lay ourselves out to sell our gas as cheaply as possible by adopting economical methods of manufacture, by keeping our capital debt as low as possible, and by cultivating the use of gas for cooking, heating, water-heating, and other industrial uses, as well as for lighting."

Salford Gas Extension Scheme.—After some discussion on rival tenders for a big extension scheme at the Salford Gas-Works, the Town Council approved, at a meeting last Wednesday, of the expenditure of £25,720 for the installation of Glover-West vertical retorts at the Regent Road works, and sanctioned the borrowing of £70,000 for expenditure on mains, services, meters (ordinary and prepayment), cookers, and gas-fires required in connection with the gas undertaking during the three years ending March, 1917.

Benzol and the Budget.—In the Financial Supplement to "The Times" last Wednesday, the following reference was made to this subject: A large insurance was yesterday placed in the insurance market at 20 guineas per cent. to secure the payment of a total loss should a tax on benzol be imposed in the forthcoming Budget. Benzol is used in the manufacture of dye-stuffs, and is also employed now as fuel for motor-cars; and apparently there is a fear that the product may be taxed as motor spirit. By the Budget of 1909, a tax of 3d. per gallon was imposed on all petrol used for motor vehicles.

ALLOCATION OF PROFITS AT MANCHESTER.

The Percentage System Defeated.

At the Ordinary Monthly Meeting of the Manchester City Council last Wednesday,

Alderman COPELAND (the Chairman of the Finance Committee) moved the Committee's resolution regulating the percentage of contributions to the relief of the rates by the various trading Committees. [The figure for the Gas Committee was 1¾ per cent.]

Alderman BOWES (the Chairman of the Tramways Committee) disagreed with the proposal, and suggested that the Gas Committee should only contribute £50,000.

Mr. W. KAY, J.P. (the Chairman of the Gas Committee), seconded, and said it was unfortunate that the sums received by the Council from the gas undertaking had not been applied in the proper direction.

Mr. SWALES supported the original proposition, and said the profits were increasing. He found from the latest figures that the Gas Committee had made a profit over 1912 of £36,381; and the Electricity Committee had made a profit over 1912 of £3192.

Mr. BOWIE and Mr. CHANTLER characterized the percentage proposal as ruinous. The latter member remarked that, had the policy of the Finance Committee that day been adopted in the past, some of the Committees would have been in a state of bankruptcy. He thought it best that the various Committees should be allowed to conduct their own financial affairs.

Alderman WAINWRIGHT pointed out that the percentage system was decided upon by a Special Committee, after many meetings.

Alderman WALKER asked the Council to take a broader view of the question. He thought they should allow reductions to be made in the price of gas, in order that gas-fires could be used, and so help to abate the smoke nuisance, and save the health of City residents.

Mr. E. D. SIMON (a prominent member of the Smoke Abatement League of Great Britain) also pleaded for the cheapening of the gas rather than increasing the contribution of the Committee to the relief of the rates.

Ex-Lord Mayor HOLT (a member of the Finance Committee), expressed the view that the Committee's proposal was a sound one. The largest portion of the ratepayers were the poorer people. Trading Committees made greater progress every year, and could well afford to pay on the percentage scale.

Eventually the amendment by Alderman Bowes, fixing the contributions in one lump-sum from each of the trading Committees, was carried by 55 votes to 29.

WEST BROMWICH MANAGERSHIP.

At a Meeting of West Bromwich Town Council last Wednesday afternoon, Mr. J. Brockhouse (the Chairman of the Gas Committee) proposed the appointment of Mr. W. H. Johns, of Malvern, as Gas Engineer, at a salary of £500 per annum, to devote the whole of his time to the duties and service of the Corporation; the appointment to be terminable by three months' notice on either side. He mentioned that they received 25 applications for the position; and he felt they had appointed the right man.

In seconding, Mr. Halford said he had never known an appointment in connection with the Council that had been given more on its merits. He felt they had the right man, who would render good service to the borough.

The resolution was carried.

WASHING AND SCREENING PAN BREEZE.

The "Nota Nos" Washer at Liverpool.

The Burnley Gas Committee last November appointed a Sub-Committee to visit Liverpool, Birkenhead, and other places, to inspect apparatus for washing and screening pan ashes. Having done so, the Sub-Committee submitted the following report:

At the Linacre works of the Liverpool Gas Company, we saw a "Nota Nos" washer. The ashes are brought direct from the retort-house in skips by an overhead telpher line. The skips are emptied into a hopper, from which they are fed on to a trough screen which oscillates lengthwise. The arrangement for feeding from the hopper did not appear satisfactory: but it is not a necessary part of the apparatus. The first screen separates out the dust and very small clinker, which forms a useful material for setting pavement or for use in making mortar. From this screen the clinker and coke are travelled by the oscillating movement on to the second stage, where they meet a current of water. The movement of the trough tends to jerk the material forward, while the current of water tends to carry it back. The coke, being lighter, is carried by the water and falls on to the third stage of the trough; but the heavier clinker travels past the jet of water, and is delivered into its appropriate shoot. We were somewhat disappointed by the appearance of the coke, which was not freed from the smaller and lighter pieces of clinker. At this works the coke was not screened into different sizes, and no attempt had been made to sell it, as it could all be used for raising steam on the works.

We next visited the Athol Street works of the same Company, where a different type of machine was employed. In this case the ashes passed through a tank of water in which was a vibrating arrangement. A weir was provided, so adjusted that the lighter material was washed over it, and the clinker was delivered by a bucket elevator into an overhead hopper. The small dust accumulating in the tank was cleared out from to time. This apparatus was subject to a considerable amount of wear and tear, and some breakdowns have been experienced. The coke is mostly used on the works, but a small quantity is sold at the reduced price of 10s. per ton for stoves.

We next inspected the plant at the Birkenhead Corporation Gas-Works. This is a "Nota Nos" washer made by the same firm as that

at the Linacre works in Liverpool, but differs in some important particulars. The method of feeding is superior. The material is tipped from barrows into the boot of a bucket elevator, which delivers it into the oscillating trough of the washer. In this machine the third stage of the trough is much longer than in the Linacre apparatus, and acts as a screen dividing the coke into three different sizes. We were informed that the coke, though not free from small pieces of light clinker, has a ready sale for use in heating apparatus, a considerable quantity being used by nurserymen. An average price of 11s. per ton is obtained. The plant at Birkenhead cost about £700, complete; and we were given the following statement of one day's work:—

Expenditure.	£	s.	d.	*Income.*	£	s.	d.
Labour	0	16	2	23 tons of coke, at 11s. .	12	13	0
Carting away clinker, about 20 tons, at 2s. .	2	0	0	5 tons of smalls for builders' mortar, at 1s. .	0	5	0
Balance to credit . . .	10	1	10				
	£12	18	0		£12	18	0

From this should be deducted interest on capital, and a small sum for steam and oil, wear and tear, &c.

We subsequently visited the gas-works at Nelson and Colne. At Nelson there is no arrangement for washing coke or ashes. The coke is brought direct from the retorts by a West's conveyor, and elevated into overhead bunkers from which carts can be readily loaded. A portion of the coke is broken and passed through a rotary screen. In this way it is freed from dust and sorted into two sizes.

At Colne a "Nota Nos" washer has been erected. It has not been used to any great extent for washing pan-ashes. The manager was not satisfied with the separation of the clinker from the coke when he tried it for that purpose. He, however, used the machine for washing broken coke. The coke passes first through a Cort's coke-cutter, from which it is elevated by a bucket elevator to the "Nota Nos" washer. This completely separates from the coke the bats and stones which are nowadays found in such quantity in our coal. The washed coke, being much freer from sulphur compounds, realizes 17s. 6d. per ton for certain purposes requiring a purer fuel.

After careful consideration, we suggest that the question of pan-ash washing be deferred for the present, but recommend that a plant should be installed at the gas-works for breaking and screening the coke. A plan has been drawn-up showing the scheme suggested. The coke-cutter will be placed below the ground-level, so as to receive the coke as it is wheeled from the retort-house. From this the broken coke will fall on to a continuous bucket elevator which delivers it into a rotary screen fixed over the bunkers. These bunkers will be erected on girders and columns. It will, therefore, be possible to fill carts by simply drawing the slides at the bottom of the bunkers. The coke-cutter will be capable of dealing with 10 tons of coke per hour, and the bunkers will have a capacity of about 38 tons.

The estimated cost is as follows: Bunkers, £240; coke-cutter, £30; elevator, £168; rotary screen, £16; motor and gearing, £40; foundations, £55; contingencies, £51—total, £600.

The report was adopted by the full Committee; and at its meeting last Wednesday the Town Council gave the necessary sanction to the work being gone on with.

COST OF THE LEEDS STRIKE.

In the course of a detailed statement as to the finances of the Corporation, Alderman C. H. Wilson (the Chairman of the Finance Committee) last Wednesday informed the Leeds City Council that the total expenditure, which was estimated at £873,000, came out at £868,000. The water-works profits were expected to be £16,000; but the revised figure was £15,000. As for the Gas Committee's profits, estimated at £30,000, these were a *minus* quantity. In the aggregate, the profits were £28,000 less than estimated; but this decrease was more than accounted for by the unfortunate position in which the Gas Committee were left as a result of the recent strike. It was not a reflection on the Gas Committee at all; but the absence of profits was entirely owing to the dislocation of their business caused by the dispute. There was no prospect of a profit next year from the Gas Committee; and he did not ask for any. The exact cost of the strike, he said, was not known; but they could see that the gas profits had disappeared for last year and next year, and he did not think in these two years they could be made good. Here the cost was £60,000. The expenditure brought about by the extra police amounted to £16,000; a further £6000 had been spent upon the Leeds police; and in addition to these, £30,000 was spent by the Special Committee in charge of the strike. The total was £112,000 so far; but there were other items which had not yet been ascertained. Thus the cost of the strike was well over £100,000. It had to be dealt with, and it had been dealt with. The benefit which the ratepayers would have was that there would be less money to be spent in the future than in the past. With regard to the preparation of the budget, he took the view that the people of the city who submitted to grave loss of Christmas trade, and those who had troubles and difficulties as to their supply of gas and other things, were entitled to consideration. It had been suggested to him that it would be wise to carry forward to another year, if necessary, some of the expenditure which they had been compelled to make; but his budget did not provide for any such carrying forward.

In the subsequent discussion, Alderman Brown contended that even if there had been no strike there would have been little (if any) gas profits. Alderman Ratcliffe expressed his disapproval of the budget, the figures of which, he maintained, did not show the position. In the Gas Department there would be for this year not only no profit, but a deficiency, for which Alderman Wilson refused to provide.

The Council, by a majority of one vote, adopted the budget, under which the rates for the year are not to be increased.

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THE RECENT BLACKBURN STRIKE.

There was another long debate in the Blackburn Town Council last Thursday on the subject of the cost of the strike. Mr. J. R. Hartley (the Chairman of the Gas Committee) defended the expenditure on the ground of public necessity, and said, though mistakes might have been made, they had been careful not to allow any waste. The Joint Lamp Sub-Committee reported that they had considered the question of the reorganization of the lamp department, and recommended that a system of automatic lighting be installed, and that the matter be referred to a Special Sub-Committee to inspect and report on the systems in use in other towns.

The Council adopted the report of a Sub-Committee who recommended that the stokers at the Greenbank Gas-Works be paid 5s. 8d. per shift; and that a small Committee should report on the question of the payment of a regular weekly wage for the labourers, and also consider the question of the wages of the coal-shed men at Greenbank. It was further recommended that the Gas Engineer obtain tenders for the installation of new telpherage plant at Greenbank, and that a deputation be instructed to visit and inspect gas-works in other towns in connection with the question of the reorganization of the Blackburn Gas-Works.

MOTHERWELL GAS-WORKS TRANSFER.

The Purchase Price.

It is rumoured that the price to be paid for the Motherwell Gas Company's undertaking has now been decided upon. The Company's claim was for something over £200,000, which would have given the shareholders rather more than £4 per share. The two Arbiters—Mr. Yuill, of Dundee (who acted for the Company), and Mr. Hislop, of Paisley (who was for the Town Council)—could not agree as to the price. They therefore referred the matter to the Oversman (Mr. Alex. Wilson, of Glasgow) who was appointed by them to fix the price should they not be able to agree.

Mr. Wilson, it is understood, has now fixed the price at £140.000, which brings out the figure per share to about £2 10s. The shares were changing hands at under £2 before the resolution of the town to purchase was intimated; so that in the award there is a fair addition to the share value. This should satisfy the shareholders; while the town have the undertaking at a figure which should enable them to carry on the gas supply at a reasonable charge.

In this arbitration witnesses were not examined, nor were Counsel retained; the two Arbiters themselves examining the accounts and works and deciding as to their value.

BOLTON AND DARWEN WATER ARBITRATION.

The Award.

By the Bolton Corporation Act of 1905, the Corporation of Bolton were directed, after the expiration of eight years from the passing of the Act, to supply to the Corporation of Darwen 300,000 gallons of water per day. It was provided that, in the event of the Corporations failing to agree as to the price to be paid for this water, or as to the point of delivery, the Local Government Board should appoint a water engineer to determine the matter. The Corporations failed to agree on the question of price, and the Board appointed Mr. H. Howard Humphreys to decide it. A report of the proceedings at the subsequent arbitration will be found in the numbers of the "JOURNAL" for Feb. 3 (p. 308) and Feb. 17 (p. 458).

Mr. Humphreys has now issued his award, by which he directs that the Corporation of Darwen shall pay to the Corporation of Bolton, "at such times and in such manner as may be mutually agreed upon between the parties, the total and inclusive sum of $7\frac{1}{8}$d. for each and every 1000 gallons of pumped, filtered, and properly treated water which the Corporation of Bolton shall deliver from the meter at the boundary of the districts and near the junction of the Cadshaw Brook with the main road to Darwen." Each party will pay its own costs; and the expenses of the award are to be equally divided.

METROPOLITAN WATER BOARD.

The Past Year's Working—Estimated Deficiency for 1914-15.

At the Meeting of the Metropolitan Water Board last Friday, the Chairman of the Finance Committee (Mr. P. B. Malone, J.P.) submitted a memorandum on the estimates for the ensuing year. He first dealt with the approximate results of the financial year just closed, and said the estimated deficiency was £97,230; but so far as could be ascertained, it would be only about £32,000. Coming to the estimates, he put the water-rental at £2,896,500, compared with £2,895,400 for the past year; and the total income from all sources was estimated at £2,931,470, against £2,918,680. The expenditure was estimated at £3,036,670, compared with £2,960,180. Two-thirds of the Board's outgoings were made up of debt charges and rates and taxes. These two items alone amounted to about £2,087,000 out of a total of £3,100,000, and both items were outside the Board's control. As to the debt charges, out of nearly £50,000,000, the Board had themselves in ten years only expended some £3,000,000. The income was estimated (including accommodation works) at £3,011,970, and the total expenditure at £3,106,670; leaving an anticipated deficiency of £94,700. Attention was called to the following facts: The Board's expenditure on revenue had increased on an average by £27,088 per

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annum, while the income had grown at the average rate of £25,744 per annum. The result of legal decisions had been to throw doubt on certain items of income, the effect of which might still further retard the rate of increase; and in 1923 provision would have to be made for the redemption of the acquisition debt, which would entail a contribution of something like £144,000 per annum. In view of these facts, the Board might have to consider whether the time would not shortly arrive when the water charges, from which the main income was derived, would have to be thoroughly gone into. Meanwhile it was clear that the deficiencies would continue.

THE STRIKE AT FLETCHER, RUSSELL, & CO.'S.

There were further developments last Wednesday in the strike at Messrs. Fletcher, Russell, & Co.'s works, at Wilderspool, Warrington. The Directors received, in accordance with their promise, a deputation of the workers representing each department, and subsequently issued the subjoined official statement.

"The members of the deputation were informed that the Directors were agreed that, if any complaint were made by a workman from any shop, he must take it to his foreman. If the foreman could not decide it, it must go to the manager of the works; and if he could not decide it, it must be left to the Board of Directors, who would meet a deputation of the men from the particular shop making the complaint. The complainant could be accompanied by one outside official with the Directors, if he so wished. The Directors state they cannot see their way to go any further towards a settlement of the matter."

The conference lasted two hours.

PEACE EFFORTS FAIL.

Peace negotiations were broken off on Friday night, when the men, at a hurriedly convened meeting, decided that they could not accept the terms offered by the firm on Wednesday. A letter sent to the firm states that "the men have decided to leave the present grievances in abeyance until the terms of union recognition have been decided."

Demand for Coke in Leeds.—As a result of the Yorkshire coal strike, there is a great demand for coke in Leeds, and the different gas-works are being besieged by people anxious to obtain fuel. In fact, says a local paper, so keen has been the demand that the stocks at York Road and Meadow Lane have become exhausted; and supplies are being conveyed from the New Wortley works to these depôts. Mr. W. B. Leech, the Manager, stated that there were about 7000 tons of coke on hand towards the end of last week, but this would be quickly disposed of if the strike continued. While it lasted, the price of coke would be 14s. 2d. a ton for Leeds people, the same as before; but it would not be sold at this figure to outsiders.

GLOVER AND MAIN, LIMITED.

In moving the adoption of the report and accounts at the annual general meeting, the Chairman (Mr. R. B. Main) said that sales had been maintained on a satisfactory basis. Costs of all their manufactured goods had increased; and there seemed small prospect of these costs being reduced. The British Commercial Gas Association had rendered excellent service to the gas industry by their splendid system of advertising the use of gas for industrial and domestic purposes. The firm had recently remodelled the kitchen in the Carlton Club, London, and supplied apparatus for the new offices of the Metropolitan Railway Company, Burlington Hotels, Waterloo Station refreshment rooms, post office, &c. The total revenue received through the trading companies was £18,762, as compared with £17,932 in 1912. The growth of the business during recent years—especially the increase in the Colonial trade—had necessitated certain alterations and additions to the buildings at Edmonton, on which a moderate sum would have to be expended this year. The laboratory, under the control of an expert research chemist, was being remodelled; and when it was finished, tests, experiments, and research work generally would be carried out under more favourable conditions than had hitherto been possible. Meantime, this department was doing very good work, and was of much value to the business. Final dividends were recommended at the rate of 5 per cent. per annum on the preference share capital, and at the rate of 10 per cent. per annum (making 7½ per cent. for the year) on the ordinary capital—leaving £1544 to be carried forward.

In seconding the adoption of the report, Mr. Thomas Glover remarked that it was now just seventy years since the business of Messrs. Thomas Glover and Co. was established in London by his grandfather. The type of ordinary dry meter which he was the first to produce on a commercial scale was, with very few modifications, exactly the same in form now; and history was in a good way of repeating itself, as the firm's present type of prepayment meter (for the design of which his father was very largely responsible), with its integral price-changer, had been adopted, with very few modifications, by the majority of other manufacturing firms. Gas companies were now beginning to realize the important fact that, while the meter might have proved correct before it was fixed and after it was removed from a consumer's house, if quantities of gas a great deal in excess of the quantity for which it was originally designed were passed through the meter while it was in use, it must be operating against the suppliers. He would strongly urge upon suppliers of gas that it was advisable, in order to keep down the unregistered gas, to see that larger meters than hitherto were installed. Small meters which were fixed with slot-installations, and which might have to supply gas to a cooker, several lights, and perhaps a boiling-ring, were not large enough to cope with the strain put upon them; and it was of little avail so to construct the meter that it would work at a greater number of revolutions per minute. He remarked on the excellent manner in which the recent National Gas

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Exhibition was organized by all—from the President (Sir Corbet Woodall), and Mr. F. W. Goodenough, downwards—and emphasized the good work being accomplished by the British Commercial Gas Association, to which organization, he intimated, the Company were doubling their subscription. Passing on, he expressed disagreement with the statements sometimes put forward that gas-fires have reached the highest possible pitch of efficiency, and that there is no further room for improvement. Therefore he urged gas suppliers and distribution departments, even at the cost of some inconvenience to themselves, to allow gas-fire manufacturers a still further period for improving the radiant and hygienic efficiency of their fires, before attempting their standardization.

The report was adopted, and the dividends recommended were then declared.

ANTWERP WATER-WORKS COMPANY, LIMITED.

A Good Increase in Business.

At the annual meeting of the Company held yesterday week, at the Cannon Street Hotel, Mr. George Evans (the successor in the chair of the late Mr. Easton Devonshire) had an excellent report to submit to the shareholders. Among other things, it stated that the income from all sources amounted to £110,355, as compared with £101,994 for 1912; and, after deducting working expenses, the cost of laying on services, and London expenses, there was a balance of £77,268. Adding to this sum the undivided profit of £8033, and interest on investments £1293, made a total of £86,595. Against this had been charged debenture interest and income-tax for 1913, Trustees' fees, the interim dividend of £18,000 (at the rate of 12 per cent. per annum), the transfer to the sinking fund for redemption of debentures of £7370, and for that of the share capital £6250, and the Directors' extra remuneration of £2780; leaving a balance of £41,314. The Chairman, in moving the adoption of the report, said they had again had a good year in general business—the increase in the receipts having amounted to upwards of £8000. Very excellent working was also shown by the pumping costs. Although coal had cost 1s. 4d. per ton more, and 3 per cent. more water was pumped, the consumption of coal was reduced by 300 tons. The capital expenditure had again been large on the additions to the pumping-stations at Waelhein and Notmeir, but almost entirely at the latter station. The Company had exhausted the whole of their borrowing powers, having placed the balance of £8300. All expenditure in excess of this would therefore have to be provided out of revenue, or, in other words, from amounts set aside annually towards reserves. To meet this, it was proposed to transfer 15 per cent. to be set aside from the profits each year to reserve to reduce the over-expenditure; so that he could not hold out any hope that the reserve of £30,000 would materially increase during the next two or three years. The motion, having been seconded by Mr. John Kennedy, was adopted. Afterwards, a resolution was passed authorizing the percentage of net profit to be appropriated to the reserve fund to be increased from 5 per cent. to 15 per cent. annually, until the reserve fund amounts to one-third of the nominal capital, or £100,000. A further resolution was passed, empowering the setting aside of £6250 as the contribution to the sinking fund for the repayment of the share capital, £7370 as the contribution to the sinking fund for the repayment of the 4 per cent. debentures, the paying of the balance of dividend at the rate of 12 per cent. per annum (free of income-tax), the transferring of £1769 to special reserve, and carrying forward £11,586. The retiring Directors (Mr. W. H. Blaber and Mr. R. S. Hankinson) were re-elected; but it was stated that the last-named gentleman was seriously ill. Subsequently, the Chairman gave some information regarding the position of the new works from the report of the Consulting Engineer (Mr. F. S. Courtney); and the Manager (Mr. W. Van der Taclen) gave some particulars as to the situation generally in Antwerp, which was highly favourable to future prospects. A vote of thanks was passed to the Chairman and Directors, to the Secretary (Mr. J. M. Hamilton), and to the Manager (including Dr. Kemna, who still renders valuable service to the Company, although his official connection has been severed).

Tar Macadam for Road Surfacing.

At a recent meeting of the South-Eastern District Section of the Institution of Municipal and County Engineers, Mr. W. H. Maxwell, of Tunbridge Wells, read a paper entitled "Have Bituminous Methods of Construction Solved the Modern Road Problem?" Referring to tar macadam, he said some disadvantages commonly experienced in its use were these: (1) It could not be satisfactorily laid and repaired during wet and cold weather; (2) it would not withstand heavy traction-engine traffic for a considerable period after it had been laid; (3) it was liable at all times to soften slightly under hot sun to an extent sufficient to admit of damage by heavy traffic; (4) during a hot summer it was liable to creep towards the sides of the roadways, especially on country roads where the lateral support of a kerb and footpath was not available; (5) its cost was, as a rule, considerably beyond that of a granite macadam tar-painted surface; and (6) its useful life could not always be so accurately predicted. Notwithstanding all the difficulties which might be enumerated, Mr. Maxwell said much successful work had been carried out, and every case must be carefully considered on its merits, with special reference to local traffic situation and conditions of the site. The official figures of cost per square yard given in the Road Board's interim report (January, 1913) for different classes of tar macadam and for pitch-grouted macadam were as follows: Kent rag tar macadam, 3½ inches finished thickness, 2s. 8d.; selected blast-furnace slag tar macadam, 3 inches thick, 3s. 3d.; selected blast-furnace slag tar macadam, 4 inches thick, 3s. 8½d. to 4s.; blue Guernsey stone tar macadam, 4 inches thick, 4s. 1d.; single pitch-grouted macadam, 3 inches thick, 4s. 1d.; double ditto, 4½ inches thick, 5s. 7¼d.

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NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

The Informal Meeting of the Scottish Gas Managers passed off with its usual success, or possibly with rather more than its wonted usefulness. Not only was Mr. Wilson's presidential address descriptive of good work done and of several troubles satisfactorily surmounted, but it was practical, and raised questions of general interest which evoked a good discussion. After all, this is the real purpose of a presidential address; and it is gained by such a recital of difficulties and by laying some of them before one's fellows for their consideration. Mr. Wilson was not afraid to speak of failures as well as successes, and to ask plainly for help in solving certain questions, which, if answered satisfactorily in his case, would be of great service to the gas profession generally. The subject of the rusting of the wrought iron and steel of the apparatus in the works and of the inside of the service-pipes is one to which gas managers must take immediate steps to put a stop; otherwise the expenses of upkeep will quickly mount up to something near the sum usually claimed by experts when valuing for a town council anxious to purchase the undertaking of a gas company in their area. This rusting, while it may be due to the oxide used for purification—and one has found a proof of iron being carried forward with the gas when experimenting with silica ware in high-pressure lighting, which will call for future experimenting—may be due not to the oxide itself, but to the quantity of air used for revivifying the oxide *in situ*, which it is to be feared exceeds in many cases what is necessary for the conversion of the ferrous sulphide into ferric oxide and sulphur. This excess of air will then pass forward with the gas, and the oxygen which it contains will act as an oxidizing agent in the rusting of the wrought iron or steel.

It was good to see the veteran Mr. Hislop, of Paisley, about again after his recent accident, and ready to talk of his experiences. If he could have recorded all his trials and tests of the various processes employed in gas manufacture, they would have filled a large volume, and one which would have proved of enormous value to many who will again and again try the experiments which he has done before, having found their uselessness or otherwise. Unfortunately, these experiences are frequently unrecorded, and are therefore lost to the profession; so that it is more and more advantageous to have these veterans of Mr. Hislop's calibre ready to come before their brethren and give them of their valuable knowledge. Another whom it was good to welcome again was Mr. T. Wilson, of Coatbridge (who is the father of the President), who has recently been severely indisposed, and who, although asking permission to speak from his chair, showed all the old fire and humour for which he has been long known. Mr. T. Wilson may always be relied upon to give the discussion a lively turn, and to say something which will call for remark by others in the room. As Mr. Langlands said, when thanking the President formally for his address, what is wanted for ensuring a good discussion is for the President to attack other managers on their methods and their results. Mr. Alex. Wilson—what a lot of Wilsons there are—made a good point in the expression of his hope that the Glasgow Corporation would impose a gas-rate for smoke prevention, which would enable the Gas Department to supply gas at a cheap rate.

The presence of Mr. Mason, of the British Commercial Gas Association, and the clear and convincing remarks he made on the lack of support his Association received in Scotland, made one wonder if the Scot has retained his full powers of seeing where he can gain not only his "saxpence" back, but much more for the coin which he is traditionally said to have "banged." As Mr. Mason said, the Association is a "business proposition," and one which should be supported by all gas suppliers, who will be provided with the means of pushing their wares at much less cost than can possibly be done by individual effort. Mr. Mason put the case very clearly; and it is certain that, so far as his hearers were concerned, he has convinced them. Unfortunately he was speaking to those who were probably already aware of the usefulness of the Association. Like the clergyman who complains of the non-attendance at church of the backslider, his remarks fall upon those who are already aware of their duty.

Two schemes for introducing electric light into towns already supplied by gas have been carried a stage further. Several officials of Galashiels and Selkirk have had meetings with the officials of the Board of Trade in London regarding the Galashiels district electric scheme. As modified, the maximum price for energy will be: For public lighting and for power, 3d. per unit for the first 400 hours of supply, and 2d. per unit thereafter; for general lighting, 10s. up to 20 units, and 6d. per unit for any additional quantity—this arrangement to commence every quarter. These are, of course, maximum prices; and if any business is to be done by the Company they will have to substantially reduce them. It was at first understood that the scheme only included the supply of energy, and did not embrace the lighting of the town. But, as in so many other places, it has been found that the supply of energy alone does not prove remunerative; and unless the current is used for lighting also, the price at which it can be supplied is prohibitive. The Wick Town Council have agreed, by 10 votes to 5, to give the Edmundson Electricity Corporation way-leave for an electric lighting undertaking in the town. The Council are not asked to assume financial responsibility in the electricity undertaking, and do not consider it their business to safeguard the Gas Company's dividends. In view of the fact that the Wick Gas Company only supply some 15½ million cubic feet of gas annually, and that the sole industry is a fishing one, there is not much room for a second supplier of light.

The Town Clerk of Kirkcaldy has suggested that, instead of worrying about the law as to the building of new gas-works, the Gas Committee should first decide, from the practical and ordinary financial point of view, if it be advantageous to build new works. Then, should the town be advised that the existing law does not admit of building, the proper course in a matter of such magnitude would be to apply for an alteration of the law. Such an alteration, he says, would not cost ½ per cent. on the price of new gas-works.

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CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

The market for London tar products remains almost without change. The only alteration is that pitch is steadier than recently, and that makers are disinclined to accept the present price. Values are: Pitch, 38s. net per ton. Creosote in bulk, 3⅜d. net per gallon. Pyridine bases, 8s. 3d. to 8s. 6d. net per gallon in buyer's packages. Anthracene, 45-50 per cent., 2d. per unit, casks free. Benzol, 90 per cent., 1s. 2d. net per gallon in buyer's packages. Toluol, 90 per cent., 1s. net per gallon naked. Solvent naphtha, 10⅜d. per gallon net and naked. Sixties crude carbolic acid, buyers 1s. 1d. to 1s. 1½d.; sellers 1s. 2d.

The position of sulphate of ammonia is still unsatisfactory; but the heavy shipments made last month, together with the effect of the coal strike in Yorkshire, are likely to help the price. For the quality guaranteed minimum 25 per cent. ammonia, sellers ask £11 17s. 6d. net and naked per ton, while dealers hope to cover at less money.

Tar and Tar Products in the Provinces.

The average values during the week were: Tar, 25s. 6d. to 29s. 6d. Pitch, east coast, 37s. to 37s. 3d.; west coast, Manchester, 36s. to 36s. 3d.; Liverpool, 36s. 6d. to 36s. 9d.; Clyde, 36s. 6d. to 37s. 6d. Benzol, 90 per cent., naked, North, 10¼d. to 10½d.; 50-90 per cent., naked, North, 10d. to 10½d. Toluol, naked, North, 10½d. to 11d. Crude naphtha, in bulk, North, 4¾d. to 5¼d. Solvent naphtha, naked, North, 9¾d. to 9¾d. f.o.b. Heavy naphtha, naked, North, 9d. to 9½d. f.o.b. Creosote, in bulk, North, 3⅛d. to 3¼d. Heavy oils, in bulk, 3⅜d. to 4d. Carbolic acid, casks included, 60 per cent., prompt, east and west coasts, 1s. 0½d. to 1s. 1d. Naphthalene, £4 10s. to £10; salts, 55s. to 60s., bags included. Anthracene, "A" quality, 1½d. to 1⅝d.; "B," nominally ¾d. per unit, packages included and delivered.

Sulphate of Ammonia Prices in the Provinces.

LIVERPOOL, *April* 4.

During the past week the tone of the market has continued quiet, and prices have been inclined to recede further. There has been a fair demand for the covering of contracts in the near position, but new orders have not been plentiful, either for export or for the home trade. The nearest values at the close are £12 2s. 6d. to £12 3s. 9d. per ton f.o.b. Hull, £12 3s. 9d. to £12 5s. per ton f.o.b. Liverpool, and £12 5s. to £12 6s. 3d. per ton f.o.b. Leith. Manufacturers have modified their views to some extent for forward delivery, and it is reported that first-hand transactions have taken place at £12 per ton f.o.b. at the ports, in equal monthly quantities, over the second half of this year.

Nitrate of Soda.

The market for this article is quiet, but fairly steady at 10s. 6d. per cwt. for ordinary quality, and 10s. 9d. for refined, on spot.

From another source it is reported that a very quiet week has again been experienced in sulphate of ammonia, and the value is written down to the extent of about 1s. 3d. per ton. Outside London, makes are quoted at £11 12s. 6d; Hull, £12 5s.; Leith, £12 7s. 6d.; Liverpool, £12 6s. 3d.; Middlesbrough, £12 5s. to £12 6s. 3d.

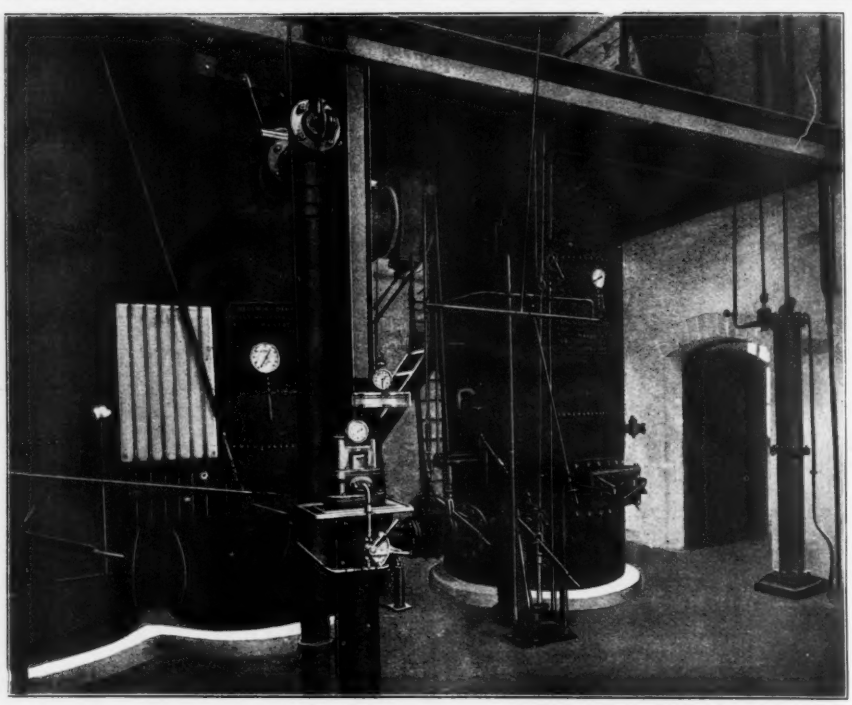
COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade is excited and irregular, with varying quotations, through the Yorkshire strike driving some orders for fuel into the Newcastle district. Producers are, however, slow to quote except for small lots for immediate delivery. In the steam coal trade, the inquiry is full. As far as any price can be given, from 14s. 6d. to 15s. per ton f.o.b. is quoted for best Northumbrian steams; 14s. per ton for second-class steams; and steam smalls are higher at 7s. to 9s. In the gas coal trade, the demand is good, and for prompt supplies the prices are higher. Best Durhams are 14s. 6d. per ton f.o.b.; second-class gas coals about 13s. 9d.; and "Wear specials" are near 15s. 9d. per ton f.o.b. These prices, however, are variable—the time of delivery being one of the chief factors in the change. Practically the whole of the contracts for the Metropolitan Companies have now been fixed; and the prices are roundly about 2s. per ton less than those of a year ago. Other contracts show corresponding reductions. But there is now less disposition to contract till the labour difficulty is removed; and thus the actual new business is limited at present, with high prices asked for early lots. Coke is naturally firmer for export. Gas coke is steady; and for good qualities about 13s. 6d. per ton f.o.b. in the Tyne is quoted. The output is good for this season.

London Coal Contracts.

The following remarks upon the London coal contracts appeared in last Tuesday's papers: The great London Gas Companies—the Gas Light and Coke and the South Metropolitan—who in supplying the Metropolis with light and heat carbonize nearly 4,000,000 tons of gas coal per annum, have just completed contracts with the coalowners of the North for their supplies over twelve months from June next. The negotiations for these supplies have been in progress for some time, but have now resulted in purchases of Durham gas coal at prices ranging from 10s. 7½d to 12s. a ton f.o.b. Tyne or Wear. Part of the Gas Light and Coke Company's contracts are arranged on a c.i.f. basis (including delivery in the Thames); but, after deducting the freight dues, &c., f.o.b. prices are practically those named. It is interesting



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to note that these figures register a fall of about 2s. to 2s. 1½d. a ton on the contract rates of last year, when the f.o.b. prices ranged from 12s 9d. to 14s. a ton, according to quality. This deduction has not been obtained without hard bargaining; for the North Country coal-owners are in a fairly strong position, and some of them have conceded this substantial reduction with great reluctance. The fact, however, that one of the London Companies a little while ago purchased 250,000 tons of Westphalian washed nuts appears to have had some influence on the North Country producers, who naturally did not relish their important London business going to Germany. In connection with these contracts, it may be noted that several North Country and London firms of shipowners have guaranteed tonnage to carry a large portion of the above-mentioned quantities over the year at a rate of freight of 2s. 10½d. per ton, which compares with 3s. to 3s. 1½d. done for similar business for the contract year now closing. The balance will be carried in steamers owned by the contracting collieries.

Manchester and the North Cheshire Water Company.

Alderman Holt, J.P. (the Chairman of the Manchester Corporation Water Committee), at the ordinary monthly meeting of the City Council last Wednesday, drew attention to a recommendation that the undertaking of the North Cheshire Water Company, together with the mains, roads, works, &c., be purchased for £138,400; it being understood that the Company will obtain all necessary consents to the sale and purchase, and also the consents of the local authorities to a revision of the rates and charges for the supply. The revenue, he said, would pay interest and sinking fund; and at the end of fifteen years there would be a saving to the ratepayers of the district of £6000 per annum. The recommendation was adopted without discussion.

Nottingham Water Supply.

Mr. A. R. Atkey (the Chairman of the Nottingham Corporation Water Committee), who speaks from an intimate knowledge of the conditions, from the fact that before occupying his present position he was an official in the City Water Department, supplied some interesting particulars at a meeting last week in relation to the Nottingham water supply. It is obvious from his explanation that, had the available resources close at hand been estimated at their true worth, the city might have been saved the heavy financial incubus entailed by its participation in the Derwent Valley scheme. The burden is already considerable; but as much further expenditure remains to be incurred in tapping the head waters of the Derbyshire territory, the mistake which was made through Nottingham's participation with Derby, Leicester, and Sheffield in the gigantic engineering project is becoming increasingly apparent. The sandstone formation which has been tapped in Nottinghamshire, and the resources of which are practically inexhaustible, has provided the city with that which, in Mr. Atkey's view, is probably the purest supply of water in England. With it no filtration is necessary. Meanwhile, however, the unfortunate section of the Nottingham inhabitants to whom has been accorded the doubtful privilege of using the water from the upper reaches of the Derwent, are loud in their protests as to the questionable quality of that supply.

Messrs. E Catchpole and Sons, of Plough Bridge, Rotherhithe, manufacturers of refined coal tar and bituminous binders for surface dressing and construction of roads, intimate that Mr. Henry W. Catchpole is retiring, but that the remaining partners will continue to carry on the business under the same style and at the same address.

APPLICATIONS FOR LETTERS PATENT.

7236-7.—Hall, I., "Burners." March 23.
7238.—Hall, I., "Muffle furnaces." March 23.
7325.—Reid, R., "Gas-heating burners." March 23.
7330.—Webber, W. A., and Payne, G. F., "Prepayment meters." March 23.
7338.—Dessauer Vertikal-Ofen-G.m.b.H., "Heating retort-furnaces." March 23.
7341.—Wilson, J. H. & G., "Meters." March 23.
7371.—Rees, A. P., and Bush, A. W., "Combined washing-boilers and gas-cookers." March 24.
7453.—Comings, W. R., "Valves and cocks." March 24.
7466.—Dessauer Vertikal-Ofen-G.m.b.H., "Heating retort-furnaces." March 24.
7501.—Roberts, D. & F. H., "Mantles." March 25.
7544.—Scharrer, H. C., and Frommon, V. G., "Casings for pipes." March 25.
7573.—Heiderich, E., "Retorts." March 25.
7597.—Onwood, A., "Pyrometers." March 25.
7598. Powling, S. & F. H., "Centrifugal gas maker." March 26.
7632-3.—Tooth, L. F., "Gas-furnaces." March 26.
7634.—Tooth, L. F., "Ball-and-socket joint for gas-lamps." March 26.
7635.—Tooth, L. F., "Crucible and melting-pot furnaces." March 26.
7636.—Tooth, L. F., "Furnaces for boiling or melting." March 26.
7637.—Tooth, L. F., "Atmospheric burners." March 26.
7643.—Lane, W. H., and Blumfield, Ltd., "Pipe-jointing devices." March 26.
7728.—Turnbull, J. W., and Foster, J., "Dry meters." March 27.
7757.—Glover, S., and West, J., "Regenerator settings for vertical retorts." March 27.
7763.—Campbell, F. W., "Mantles." March 27.
7798.—Westf. Gasglühlichtfabrik, F. W. & C. Killing, "Lighting gas-lamps from a distance." March 27.
7827.—Bestehorn, H., "Packing mantles." March 27.
7898.—Williams, W. M., "Production of gas." March 28.

100 PER CENT. BETTER TERMS.

(THE REASONS WHY.)

By a Special Contributor.

"While giving thirty years for Cast-Iron Tubes, we "give only twenty years for Steel Tubes when "not tapped, and fifteen years when tapped."

This, under any circumstances, would be a very notable announcement, whatever be the business matter to which it related. For it means in the first instance 50 per cent., and in the second instance 100 per cent., better terms.

It becomes outstanding, indeed in more senses than one commanding, when we learn that the Statement describes the conditions under which the Government sanctions loans for certain Public Health, Sanitation, and Illuminating Purposes.

The words were used in an explanation offered to the representative of a leading South Wales journal who had sought information at the Offices of the Local Government Board as to the reasons for a communication addressed by the Board to the Tredegar Urban District Council.

What can be the reasons for Terms so contemptuous of Steel Tubes?—

"It is," continues the report in "The South Wales Daily "News," "because the Board are advised by their En-"gineering Experts that Steel Tubes have a 'shorter' life "than Cast-Iron Pipes."

A very sensible, sound, business-like reason, most people will agree—a reason to be taken to heart by Municipal Administrators everywhere.

This attitude upon the part of the Local Government Board, however, is scarcely justified—if we have regard, that is to say, to some recent instances of the "unserviceability" of Steel Tubes for Water Mains. Witness, among many others, the following:

1. At Atlantic City, U.S.A., some seven miles of 48-inch pipe are being installed, at a cost of about £60,000 to £70,000, to replace steel piping only 12 years in use, this having already been found beyond repair.

2. At Troy, U.S.A., about 7 miles of 30-inch steel pipe, which has gradually been going out of service since it was installed some 13 years ago, is being replaced by Cast-Iron pipes at a cost of about £45,000.

Are not the terms laid down by the Local Government Board—enormously favourable as they are to Cast-Iron pipes—altogether too generous to Steel Tubes?

One Hundred per cent. Better Terms! There must be very exceptional qualities in Cast-Iron pipes when they are so countenanced by a responsible Government Department. In addition to the initial economy, the community obtains reliable and, in fact, almost everlasting work.

Surely the prudent men who man our municipal bodies will not permit themselves to be misled by the seeming cheapness of the first cost of a material capable of giving results like the above, so disastrous to the interests of the Commonwealth?

[Advertisement.

Keighley Gas Manager's Salary.—The Gas Committee submitted a recommendation to the Keighley Town Council that the salary of the Gas Manager (Mr. W. Baillie) should be increased from £375 to £450 per annum; and when the matter was brought forward it was pointed out that the undertaking is now among the first six in the kingdom for cheapness of production, and would probably stand still higher if it were not for the cost of carriage of the coal. Mr. Baillie's services were freely acknowledged; but it was felt by some members that the increase proposed was too much when comparison was made with the salaries of other officials of the Corporation. An amendment to increase the Manager's salary by £45 was carried.

Water Supply in the Lincolnshire Fens.—Difficulties experienced by local authorities in regard to water supply in the Lincolnshire Fens yearly become increasingly serious. To meet the needs in the Spalding district, it was recently suggested that the local authority should acquire certain rights vested in the South Lincolnshire Fen Water Company; but at the last meeting of the Spalding Rural District Council it was reported that the Courts had held that the Receiver who had been appointed in relation to the affairs of the Company could not sell to the Council the Company's bore at Deeping St. Nicholas except under the authority of a Private Act. As the process of obtaining this statutory permission was regarded as too costly, the authority have decided to extend the pipes of another bore in the locality.

Belfast Gas Officials' Salaries.—The Belfast Corporation have adopted a recommendation of a Special Committee on Salaries for an increase of the salary of Mr. J. D. Smith (Gas Manager) of £100 a year for two years, bringing the salary up to £1200 a year; an increase of £25 a year to Mr. A. Magowan (Gas Manager's Secretary) for two years, bringing the salary up to £300 a year; and an increase of £25 a year to Mr. Cleland (Superintendent of Gas-Mains) for two years, bringing the salary up to £500. A requisition was afterwards signed for a special meeting of the Corporation to rescind these and other recommendations.

Queenstown Gas Company.—Mr. F. M'Carthy, presiding at the meeting of this Company last Tuesday, expressed regret at the death of the Chairman, Mr. J. O'Mera, who for many years guided the progress of the undertaking with conspicuous success. When he took control, the financial position was very unsatisfactory; but for a long time now maximum statutory dividends had been paid, and the reserve and depreciation funds had been fairly nurtured, while more than once the price of gas had been lowered to the consumers, notwithstanding that they had had to meet higher wages and increased cost of coal. The profits for the year amounted to £1705, to which was added £610 brought forward. Dividends were declared at the rates of 10, 5, and 7 per cent., less income-tax, on the various shares, for the half year, carrying forward £611.

GAS COMPANIES IN THE STOCK EXCHANGE.

The Stock Exchange has had a much more peaceful week than might fairly have been anticipated after all the storm and stress of public affairs which marked the close of its predecessor. Business, of course, was on a reduced scale; for it was a week of uncertainties, and no one could pierce the fog which enveloped political affairs or form any safe forecast of what the *dénouement* might be. The tone of the markets varied from time to time, according as brighter or gloomier view might chance to prevail. On the whole, however, prices closed stronger, notwithstanding the fact that the last two days were flat enough to take a good bit of the cream off the rise. Business opened very quiet on Monday and continued so during the day; operators deeming it safest to "wait and see." Markets moved but slightly; but they showed some good points. Consols rose ¼; but Rails were sensitive on the labour outlook, and most of the rest were irregular. Tuesday exhibited the same attitude of watchful expectation, with the resulting indisposition to take chances; but the general feeling was rather more sanguine. Government issues were firm, and Consols gained ¼ for the account. Rails were quiet and firm. Transatlantics were supported locally, and Foreign showed confidence. Wednesday was a really bright day. Consols sprang up ¾, Rails were active at higher figures, and the rest sympathized. On Thursday, markets were still plucking up a little courage, and operators launched out more freely. Rails had another good day; but Government issues seemed a bit uncertain, and Consols did not move. Friday found the tone of cheerfulness abating somewhat in the leading departments, though lesser quarters had their good points. Consols fell ¼ for the account, Rails were weaker, and Transatlantics were dull at Wall Street's bidding; but Foreign were confident. Saturday was quite a dull day, and business was very slack; the old factors of apprehension being at work, though not acutely alarming. Markets in general were moody, and Consols fell ¼ for money and the account, closing at 76 to 76½—a net gain of ¾ in the week. The Money Market was generally firm, but showed signs of more ease toward the close. Business in the Gas Market was better in every way. In point of activity, there was a very fair quickening-up over the stroke of the last week or two, and there was a nice array of advances in quotations. Some of these were overdue by weeks. The general upward move was perhaps inspired by announcements in the daily Press—more or less founded on fact—regarding coal purchases. In Gas Light and Coke issues, the ordinary was strong and active, with transactions ranging from 101 to 102½—a rise of ½. In the secured issues, the maximum realized 77½ to 79, the preference 96¾ to 98, and the debenture 75. South Metropolitan was quiet and rather easier, changing hands at 109½ to 110½—a fall of ½. In Commercials, the 4 per cent. made 107 and 107¼, the 3½ per cent. 104 and 105, and the debenture 71½ and 73. Among the Suburban and Provincial group, Alliance and Dublin fetched 60⅜ (a rise of 2 on the introduction of new blood into the Board Room), British 44 and 44⅜, South Suburban preference 111½, Tottenham "B" 115⅝ to 116⅛ (a rise of 1), Wimbledon 116¼ and 116¾, and (on the local Exchanges) Newcastle 99¾, Liverpool "B" 143½ (a rise of 1), and Sheffield "C" 222—a rise of 1. In the Continental companies, Imperial realized 172 to 174½, Union 80 to 81½, and European 18⅛. Among the undertakings of the remoter world, Bombay made 6⅜ and 6 7/16, Monte Video 12, Oriental 121, Primitiva 6½ to 6⅝, and ditto preference 5 to 5⅛.

OFFICIAL QUOTATIONS AT THE CLOSE OF THE WEEK.

Bank Rate (fixed January 29), 3 per cent. Last year, 5 per cent. Consols, 76—76½. Previous week, 75¼—75¾.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
1,551,868	Stk.	Oct. 15	2½†	Alliance & Dublin Ord.	58–63	+2	3 19 4	75,000	5	Dec. 11	6	Malta & Mediterranean	4⅜–4⅞	..	6 3 1
374,000	,,	Jan. 15	4	Do. 4 p.c. Deb.	73–81	..	4 18 9	250,000	100	April 1	4½	Met. of Melbourne 4½ p.c. Deb.	98–100*	+⅛	4 10 0
280,000	5	Oct. 15	7½	Bombay, Ltd.	6–6½	..	5 15 5								
50,000	10	Feb. 26	16	Bourne- 10 p.c.	27⅞–28⅞	..	5 11 4	541,920	20	Nov. 27	4	Monte Video, Ltd.	11⅜–12½	..	6 10 8
352,500	10	,,	7	mouth Gas B 7 p.c.	14½–15	..	4 18 4	1,775,892	Stk.	Feb. 26	4½	Newc'tle&G'tesh'd Con.	99½–100	..	4 10 0
75,000	10	,,	6	and Water Pref. 6 p.c.	13¾–14	..	4 5 9	529,705	Stk.	Dec. 30	3½	Do. 3½ p.c. Deb.	83½–84½	..	4 2 10
380,000	Stk.	Feb. 26	14	Brentford Consolidated	258–263	+2	5 6 5	55,940	10	Feb. 26	7/14 0	North Middlesex 7 p.c.	12½–13¾	..	5 14 1
330,000	,,	,,	11	Do. New	204–209	+2	5 5 3	300,000	Stk.	Nov. 27	8	Oriental, Ltd.	120–125	..	6 8 0
50,000	,,	,,	5	Do. 5 p.c. Pref.	109–111	..	4 10 1	60,000	5	Mar. 26	10	Ottoman, Ltd.	6–7⅛*	..	6 13 4
206,250	,,	Dec. 11	4	Do. 4 p.c. Deb.	93–95	..	4 4 3	60,000	50	Feb. 26	13	Portsea, Island B	127–130	..	5 0 0
217,380	Stk.	Feb. 26	11	Brighton & Hove Orig.	198–203	+2	5 8 5	100,000	50	,,	12	Do. C	118–121	..	4 19 2
244,200	,,	,,	8	Do. A Ord. Stk.	147–150	+2	5 6 8	249,980	5	Oct. 15	8	Primitiva Ord.	6⅜–6⅞	..	5 16 5
530,000	30	Mar. 26	12½	British	44–45*	..	5 11 1	499,960	5	Dec. 30	5	,, 5 p.c. Pref.	5–5¼	.	4 15 8
120,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb. Stk.	90–92	..	4 7 0	521,600	100	Dec. 1	4	,, 4 p.c. Deb.	93–95	..	4 4 3
245,771	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	89–91	..	4 7 11	346,198	Stk.	Dec. 30	4	River Plate 4 p.c. Deb.	87–89	..	4 9 11
100,000	10	,,	—	Cape Town & Dis., Ltd.	1–2	..	—	275,000	5	Sept. 26	12	San Paulo, Ltd.	—	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	2¾–4½	..	—	150,000	10	,,	6	Do. 6 p.c. Pref.	10¼–11⅜	..	5 5 6
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	73–78	..	5 15 5	125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	48–50	..	5 0 0
157,150	Stk.	Feb. 26	5	Chester 5 p.c. Ord.	106½–107½	..	4 12 2	135,000	Stk.	Mar. 12	10	Sheffield A	222–224	+1	4 9 3
1,513,280	Stk.	Feb. 12	5/9/4	Commercial 4 p.c. Stk.	106–108	..	5 1 2	209,984	,,	,,	10	Do. B	221–223	..	4 9 8
560,000	,,	,,	5⅛	Do. 3½ p.c. do.	103½–105½	..	5 1 1	523,500	,,	,,	10	Do. C	221–223	+1	4 9 8
475,000	,,	Dec. 11	3	Do. 3 p.c. Deb. Stk.	71–73	..	4 2 2	90,000	10	Oct. 15	7½	South African	10½–11½	..	6 10 5
800,000	Stk.	,,	4½	Continental Union, Ltd.	80–83	..	5 8 5	6,429,895	Stk.	Feb. 12	5/9/4	South Met., 4 p.c. Ord.	109–111	−½	4 18 6
200,000	,,	,,	7	Do. 7 p.c. Pref.	117–122	..	5 14 9	1,895,445	,,	Jan. 15	3	Do. 3 p.c. Deb.	73–75	..	4 0 0
492,270	Stk.	—	6	Derby Con. Stk.	123–125	..	4 16 0	209,820	Stk.	Feb. 26	8½	South Shields Con. Stk.	155–157	..	5 8 3
55,000	,,	—	4	Do. Deb. Stk.	102–104	..	3 16 11	952,795	Stk.	Feb. 26	6	S'th Suburb'n Ord. 5 p.c.	114–116	..	5 3 5
1,002,180	10	Jan. 15	10	European, Ltd.	17½–18½	..	5 8 1	60,000	,,	,,	5	Do. 5 p.c. Pref.	110–112	..	4 9 3
16,386,660	Stk.	Feb. 12	4/17/4	Gas 4 p.c. Ord.	100½–102½	+½	4 15 0	117,058	,,	Dec. 30	5	Do. 5 p.c. Deb. Stk.	113–115	..	4 6 11
2,600,000	,,	,,	3½	Light 3½ p.c. max.	75–79	..	4 8 7	594,740	Stk.	Nov. 13	5	Southampton Ord.	101–104	..	4 16 2
4,062,235	,,	,,	4	and 4 p.c. Con. Pref.	95–98	..	4 1 8	120,000	Stk.	Feb. 12	7⅜	Tottenham A 5 p.c.	135–138	..	5 6 10
4,674,850	,,	Dec. 11	3	Coke 3 p.c. Con. Deb.	73–75	..	4 0 0	543,940	,,	,,	5⅞	Tottenham B 3½ p.c.	115–117	+1	5 0 5
258,740	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.	87–89	..	5 12 4	149,470	,,	Dec. 30	4	District 4 p.c. Deb.	89–91	..	4 7 11
70,000	10	Oct. 15	11	Hongkong & China, Ltd.	16⅜–17⅛	..	6 7 6	182,380	10	,,	5	Tuscan, Ltd.	5–6	..	8 6 8
131,000	Stk.	Mar. 12	7⅛	Ilford A and C	147–150	..	5 1 8	149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	95–97	..	5 3 1
65,780	,,	,,	6⅛	Do. B	115–118	..	5 3 10	236,476	Stk.	Mar. 12	5	Tynemouth, 5 p.c. max.	108½–110½	..	4 10 6
65,500	,,	Dec. 30	4	Do. 4 p.c. Deb.	89–91	..	4 7 11					Wandsworth, Wimbledon, and Epsom—			
4,940,000	Stk.	Nov. 13	9	Imperial Continental	172–177	..	5 1 8								
1,235,000	Stk.	Feb. 12	3½	Do. 3½ p.c. Deb. Red.	83½–85½	..	4 1 10	30,000	Stk.	Feb. 26	8⅜	Wandsworth A 5 p.c.	151–156	..	5 7 4
200,242	Stk.	Mar. 12	6½	Lea Bridge Ord. 5 p.c.	119–121	+1	5 7 5	255,636	,,	,,	6⅞	,, B 3½ p.c.	129–134	..	5 2 7
561,000	Stk.	Feb. 26	10	Liverpool United A	211–213	+2	4 13 11	108,075	,,	,,	5/17/3	,, C 3½ p.c.	110–115	..	5 2 0
718,100	,,	,,	7	Do. B	143–145	+1	4 16 7	352,000	,,	,,	6½	Wimbledon 5 p.c.	112–117	..	5 4 8
306,083	,,	Dec. 30	4	Do. Deb. Stk.	99–101	..	3 19 8	98,000	,,	,,	6⅝	Epsom 5 p.c.	116–121	..	5 9 6
63,480	Stk.	Dec. 30	3	Maidstone 3 p.c. Deb.	65–67	..	4 9 7	88,416	,,	Dec. 30	3	3 p.c. Deb. Stk.	71–73	..	4 2 2

Prices marked * are "Ex Div." † Next Dividend will be at this rate.

The British Gas-Mantle Company, Limited, was registered on the 27th ult., with a capital of £50 in £1 shares.

The Foundry Coke and Breeze Company, Limited, has been registered with a capital of £20,500, in 20,000 preference shares of £1 each and 10,000 ordinary shares of 1s each, to carry on the business of coke manufacturers and makers of furnaces and coke-ovens.

The electric light suddenly failed over a large portion of the Kingston district early last Thursday evening. For more than two hours the post office and the public library were without current; and in many places unprovided with gas, candles had to be resorted to Two faults in the cables proved to be the cause of the trouble.

Messrs. Tilley Bros., the contractors for supplying and fixing gas-fittings in the County Council Schools, have terminated their contract; and the Education Committee of the Council accordingly invited tenders for the work. At the meeting of the Council to-day, the Committee will recommend the acceptance of the tender of Mr. J. C. Christie.

During practice, the choir at St. Mark's Church, Newport (Mon.) noticed a slight smell of burning, but could not detect its origin. After leaving the church, the curate and a member of the choir, not feeling satisfied, returned, and eventually found that the casing of the electric light wiring in the gallery was just breaking into flames. These were promptly subdued, thus preventing a destructive fire.

A copy of their new summer booklet of gas-cookers has come to hand from the Davis Gas-Stove Company, of No. 59, Queen Victoria Street, E.C. It is attractively got up, and illustrates and describes culinary apparatus of all sorts and sizes. Two specially useful pages are those furnishing a detailed description of cooker brasswork. The "New Davis" cooker, in the body of which all screws are entirely dispensed with, enjoys a well deserved position of prominence.

The Gas Committee reported with pleasure to the last meeting of the Oldbury Urban District Council that Mr. Adam Cooke (the Manager) was progressing satisfactorily. It would, however, be at least two months before he could resume his duties. Mr. Wallace said the members would be glad to see Mr. Cooke back among them again. He was sure they all sympathized with him in his long illness; and they were pleased to know that during his absence the staff at the gas-works had given every satisfaction.

A destructive fire broke out early in the morning of last Saturday week on the house-furnishing premises of Messrs. H. J. Searle and Sons, in the Old Kent Road; the amount of damage being estimated at £25,000. No cause for the outbreak could be assigned. The brigade succeeded in keeping the fire from spreading to adjacent property occupied by the firm, though, according to the "Daily Telegraph," at one time other shops were in danger through the fusing of an electric cable.

The Gas Department of the Bradford Corporation have taken advantage of the Yorkshire coal strike to "boom" gas apparatus through the columns of the daily press. To every local newspaper they supplied a catchy little paragraph intimating that "to gas users the advance in coal prices has no terrors," and advising the householder—worried by a 5s. a ton advance in coal prices in the first three days of the strike—to go to their stores and get gas cookers, fires, &c., and very brisk business was the outcome of this seizure of the psychological moment.

The Banbridge Gas Company have just held an interesting exhibition of gas cooking and heating apparatus, which, under the progressive methods of Mr. James Woods, the new Manager, it is proposed to supply to consumers in the town. The gas-cookers came in for special attention; demonstrations by Miss Dods being a great attraction. The "St. Nicholas" gas-fire was much admired. Other exhibits included boilers, geysers, radiators, and smoothing irons, and devices of various kinds making for cleanliness, convenience, and economy of labour in the home. The exhibition was arranged by Messrs. R. & A. Main, of Falkirk and London.

The new catalogue of the various types of valves which are made by the Bryan Donkin Company, of Chesterfield, is quite a substantial book. There are valves to suit every requirement of a gas undertaking. Here are illustrated, among many other types, the well-known "Donkin" internal rack-and-pinion valve, high-pressure gas valves and cocks, the "Brentford" syphon cock, Irving's hydraulic main combination valves, and Hewett's fool-proof interlocking valve attachment (which was recently described in the columns of the "JOURNAL"). Exhausting plants and Reynolds' governors are also illustrated; and there is an appendix giving a summary of various other appliances and specialities manufactured by the firm, separate catalogues of which are issued.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

GAS MANAGER AND ELECTRICAL ENGINEER. Malvern Urban District Council. Applications by April 11.
DRAUGHTSMAN. Gibbons Bros., Ltd., Dudley.
FOREMAN. Stirling Gaslight Company. Applications by April 13.
AGENT. Box 19, Walsall Post Office.
SALESMAN AND CANVASSER (RESIDUALS). No. 5856.
CANVASSER. Y., Box 610, Smith's Advertising Agency, 100, Fleet Street, E.C.
SMITH AND FITTING WORK. Skegness Gas-Works.

Appointments, &c., Wanted.

LEADBURNER, &c. No. 5862.
LADY SCIENTIFIC DEMONSTRATOR AND CANVASSER. No. 5866.

Gas-Works Wanted.

"D. G.," c/o Scripps's Advertising Offices, 13, South Molton Street, W.

Plant, &c. (Second-Hand), for Sale.

COAL-HOPPER, &c. T. W. Ward, Limited, Silvertown, E.
PURIFIERS, &c. Brighouse Gas-Works.

Plant, &c. (Second Hand), Wanted.

STATION METER. Henry Ellison, Limited, Cleckheaton.

Sales of Stocks and Shares.

CROYDON GAS COMPANY. London Mart. April 28.
DUDLEY GASLIGHT COMPANY. By Tender. April 27.
SEVENOAKS GAS COMPANY. London Mart. April 21.
SEVENOAKS WATER COMPANY. By Tender. April 25.
SOUTHEND WATER COMPANY. London Mart. April 21.
SOUTH ESSEX WATER COMPANY. London Mart. April 21.
WATFORD GAS AND COKE COMPANY. London Mart. April 21.

TENDERS FOR

Coal.

COMMERCIAL GAS COMPANY. Tenders by April 16.
DARWEN GAS DEPARTMENT. Tenders by April 25.
INVERNESS GAS DEPARTEENT. Tenders by April 20.
WANDSWORTH WIMBLEDON AND EPSOM GAS COMPANY. Tenders by April 15.

Coke.

HALIFAX GAS-WORKS.

Exhausters and Boiler.

MACCLESFIELD GAS DEPARTMENT. Tenders by April 14.

Gasholder Repairs.

STOKE-ON-TRENT GAS DEPARTMENT. Tenders by April 16.

General Stores (Lime, Sulphuric Acid, Shovels, Forks, Iron, Lead Pipe, Buckets, Retort Bolts and Castings, &c.).

BURY CORPORATION. Tenders by April 18.
INVERNESS GAS DEPARTMENT. Tenders by April 20.
LEEDS GAS DEPARTMENT. Tenders by April 25.
WIGAN GAS DEPARTMENT. Tenders by April 17.

Lamps and Fittings.

WIGAN GAS DEPARTMENT. Tenders by April 17.

Meter.

TORQUAY GAS COMMITTEE. Tenders by April 20.

Pipes, &c.

LEEDS GAS DEPARTMENT. Tenders by April 25.
WIGAN GAS DEPARTMENT. Tenders by April 17.

Purifiers, &c.

LEICESTER GAS DEPARTMENT. Tenders by April 25.

Tar.

WIGAN GAS DEPARTMENT. Tenders by April 17.

Tar Distillation Plant, Tank, Steam-Boiler, and Old Boiler.

DUNDEE GAS DEPARTMENT. Tenders by April 21.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

EASTER HOLIDAYS.

In consequence of the EASTER HOLIDAYS, all Communications for the next issue of the "JOURNAL" and Orders respecting ADVERTISEMENTS should be received at the Office

NOT LATER than the FIRST POST ON SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.
Payable in advance. If credit is taken, the charge is 25s. a year.

Abroad (in the Postal Union): £1 7s. 6d., payable in advance.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

Telegrams: "GASKING, FLEET LONDON." Telephone: 6857 Holborn.

OXIDE OF IRON.

O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 171, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD.,
with which is amalgamated WM. PEARCE & SONS, LTD.
36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, FEN. LONDON."
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Forms of Application may be obtained from the undersigned.
Any Candidate is at liberty to forward me 20 Copies of his Application and Three Recent Testimonials (but of nothing else whatever), in stamped envelopes, for transmission to the Members of the Council.
Canvassing in any form whatever will be a Disqualification and strictly adhered to.
Dated this 31st day of March, 1914.
H. L. WHATLEY,
Clerk to the Council.
Council Offices, Malvern.

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